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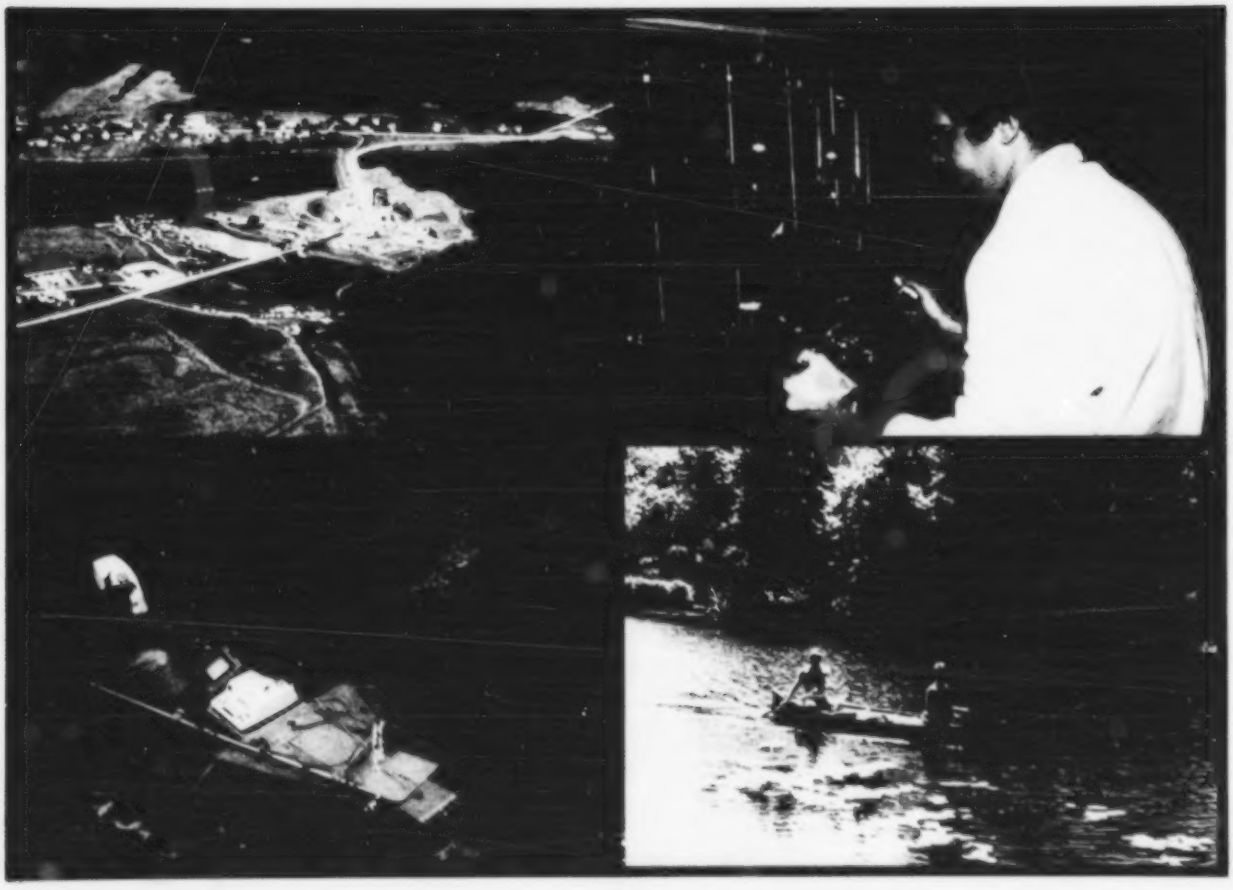
1989 ST. CROIX RIVER WATER QUALITY REPORT

1WD-AR-WQB-90-164



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INLAND WATERS DIRECTORATE
ATLANTIC REGION
WATER QUALITY BRANCH
MONCTON, NEW BRUNSWICK

1989 ST. CROIX RIVER WATER QUALITY REPORT

1WD-AR-WQB-90-164

INLAND WATERS DIRECTORATE

ENVIRONMENT CANADA

Harold S. Bailey

Water Quality Branch

Atlantic Region

Moncton, New Brunswick

December 1990

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ABSTRACT

This report presents the results of the 1989 St. Croix River water quality monitoring program. Physical parameter values, as well as major ion, nutrient and heavy metal concentrations are given for three sampling stations for the period from February 1989 to December 1989. The established water quality objectives for dissolved oxygen and pH were met on all occasions. Provisional data from the Milltown Automatic Water Quality Monitor (AWQM) are also presented for the period from January 1989 to December 1989.

Résumé

Ce rapport présente les résultats provenant du programme de surveillance continue de la qualité des eaux de la rivière Sainte-Croix pour 1989. Les résultats d'analyse des paramètres physiques, ainsi que les concentrations mesurées d'ions principaux, de métaux lourds et d'éléments nutritifs, sont présentées pour trois stations d'échantillonnage de février à décembre 1989. Les valeurs de PH et d'oxygène dissous ont toutes rencontrées les objectifs établis de la qualité des eaux. Des données provissoires provenant d'un enregistreur automatique de la qualité des eaux installé à Milltown sont aussi présentées pour la période de janvier 1989 à décembre 1989.

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1. INTRODUCTION

The St. Croix River and its tributary, Monument Brook, have a reach of approximately 124 km and form the international boundary between the Canadian Province of New Brunswick, and the American State of Maine. In the upper 110 km of the St. Croix River, the water quality is subjected to limited anthropogenic influence and is considered to represent background conditions. The region of concern in this study is a 14 km stretch between Woodland, Me. and Milltown, N.B. which is the mixing zone of a major industrial discharge from the Georgia-Pacific Kraft Pulp Mill at Woodland, Me.

The Advisory Board on Pollution Control in the St. Croix was established by the International Joint Commission (IJC) in 1962 to coordinate water quality planning and management efforts in the basin. To assist the Board in fulfilling its mandate, the Water Quality Branch conducts systematic water quality assessment in the international portion of the river. The samples collected are analyzed for physical parameters, major ions, nutrients and trace metals.

The Water Quality Branch, in cooperation with the United States Geological Survey (USGS), also collects data on temperature, specific conductance, pH and dissolved oxygen on a real-time basis via satellite retransmission from an automatic water quality monitor (AWQM) at Milltown, Me. Similarly, river discharge data are collected at the USGS gauging station in Baring, Me.

These data are used to monitor compliance with established Water Quality Objectives and will be used for the future development of other water quality objectives for the St. Croix River Basin. In 1961, water quality objectives were established with the stated goal of restoration of anadronomous fish runs, in particular, Atlantic Salmon (Salmo salar). These consist of objectives for dissolved oxygen and pH (5.0 mg/L and 60% saturation and 6.0 to 8.5 pH units respectively). By 1978, improvements in the water quality of the lower 14 km stretch of the river had made possible the passage of Atlantic Salmon, and in 1980 a re-introduction program was started.

This report assesses the water quality data from three sampling stations in the St. Croix River Basin during the period of February 1989 to December 1989. It also includes the AWQM data for the period of January 1989 to December 1989.

Previous St. Croix River Water Quality reports include Clair (1980), Lockerbie and Cullen (1981), Howell and Lockerbie (1983, 1984), Howell (1985), Lockerbie (1987), Bailey (1988, 1989).

2. METHODOLOGY

The Water Quality Branch collected samples from the St. Croix River on seven occasions between February 23, 1989 and December 7, 1989 at three sites in the river basin - Kellyland, Woodland, and Milltown. The St. Croix River at the Kellyland station is considered to be pristine and indicative of background water quality whereas the Woodland station is located 200 m below the Georgia-Pacific Pulp Mill effluent outfall and serves to characterize the chemical composition of the effluent after a slight dilution by river water. The Milltown station, 14 km below Woodland provides information on the river water quality after assimilation and dilution of the pulp mill effluent by the river. Sampling station location descriptions are presented in Table 1 and plotted in Figure 1.

Water Quality Branch sampling was conducted as outlined in "Sampling for Water Quality" (WQB, 1983) and the analytical methods employed are described in the NAQUADAT Dictionary (WQB, 1986). Selected water quality parameters, NAQUADAT codes and detection limits are listed in Table 2. Water Quality Branch, Atlantic Region, quality control procedures require that at least 15% of the samples be collected in triplicate and distilled water blanks must be prepared on each sampling occasion. The results of these QA/QC procedures are not discussed but the data generated are shown in Table 7. The triplicate samples which have been included in the tables were used in the preparation of the boxplots (Figures 2 to 4).

Each site was sampled every 6 weeks, plus or minus one week, in 1989 as compared to every 10 weeks in 1988. This reduction in sampling frequency in 1988 was necessiated by budgetary constraint. In addition as noted in the previous report (Bailey, 1989), preservation of metals and phosphorus in the field was discontinued in 1988 in favour of laboratory preservation.

The hourly data from the USGS AWQM at Milltown were obtained by using a Labarge GOES satellite retransmission platform. In this report, data are listed in daily format with minimum, maximum and mean. In addition to the measured parameters, percent dissolved oxygen saturation has been calculated, and are included in the tables. (Appendix I)

The river discharge data from the Baring gauging station have been similarly formated and are included in the monthly tables. The above noted data sets have been published for the 1989 water year - October 1988 to September 1989,(USGS, 1990). The data from October to December 1989, however, are considered to be provisional, until published by the USGS.

3. RESULTS AND DISCUSSION

3.1 1989 Grab Sample Data versus Water Quality Objectives

As a result of the small number of samples collected during this sampling period, this report will be primarily a presentation of the data with minimal interpretation of the data.

The grab sample data will be compared to the two water quality objectives, that have been established for the St. Croix River Basin. There stipulate that the dissolved oxygen concentration shall be at least 60% saturation or 5.0 mg/L whichever is greater and that the pH of the waters shall be in the range of 6.0 to 8.5 units. Data for other selected parameters will also be compared to the Canadian Water Quality Guidelines for the protection of freshwater aquatic life. These guidelines are listed in Table 8.

The 1989 Water Quality Branch grab sample data for dissolved oxygen are illustrated in box and whisker plots in Figures 2 and 3. Figure 2 indicates that dissolved oxygen concentrations for the grab samples were above the established Water Quality Objectives of 5 mg/L with median values in the 8 to 9 mg/L range as compared to the 10 to 12 mg/L range in 1988 (Bailey, 1989). The decrease in median values results from a tendency toward lower values during the summer of 1989 as well as the fact that more samples were collected in the summer of 1989 when values were lower, as compared to 1988. The monitoring values for dissolved oxygen at Milltown from June to

September compared well with the AWQM data with only a ±0.2 mg/L differential between the two.

The lowest dissolved oxygen concentration observed was 5.6 mg/L for triplicate samples at Woodland on September 12. A low of 5.7 mg/L was observed at Milltown on August 3, as the river recovered from an effluent spill at Georgia-Pacific on July 30. This will be discussed in more detail in Section 3.2.

In terms of percent saturation (Figure 3), the minimum value observed was 67 percent at Milltown on August 3. With the exception of this value, the median values for Kellyland and Milltown ranged from 90 to 100 percent saturation while Woodland ranged from 74 to 108 percent saturation.

The pH values met the water quality objective of 6.0 to 8.5 at all sites as illustrated in Figure 4.

3.2 Provisional AWQM data versus the Water Quality Objectives

According to the monthly data summary sheets (Appendix I), the daily mean concentrations for dissolved oxygen fell to 6 mg/L in July and August as illustrated in Figure 5. Median values for July, August and September were 7.1, 6.4 and 7.6 mg/L respectively. In 1989, no dissolved oxygen concentrations fell below the water quality objective of 5.0 mg/L.

The lowest measured dissolved oxygen concentration of the year occurred as the result of a spill of more than 5,000,000 gallons (U.S.) of partially treated effluent from the Georgia-Pacific Corporation on July 30, 1989. The dissolved oxygen at Milltown fell from 7.04 mg/L at 0200 hours on July 31 to 5.55 mg/L at 0800 hours according to the AWQM hourly data. The spill documentation, including data and graphs, is appended (Appendix II).

A scan of the monthly data sheets (Appendix I) also indicates that the pH values were within the 6.0 to 8.5 water quality objective range. For the most part, pH values were nearly neutral ranging from 6.8 to 7.0.

3.3 St. Croix River at Kellyland - Station No. 00NB01AR0013

The Kellyland sampling station is located 15 km above Woodland and is representative of background water quality. Water temperature ranged from 0.6°C on February 23 to 22.0°C on August 5. Dissolved oxygen concentrations ranged from 7.6 mg/L (89% saturation) on August 3 to 13.3 mg/L (96% saturation) on February 23, 1989. Laboratory measured pH ranged from 6.5 to 6.9 for the sampling period. The apparent colour was between 20-70 Hazen units with a median value of 40.

The background waters of the St. Croix River are dilute, with specific conductance ranging from 30 to 36 µS/cm. The dominant cation is calcium followed by sodium, magnesium and potassium. The

anions are dominated by bicarbonate followed by sulphate and chloride.

Concentrations of copper, lead, mercury and cadmium were below the limit of detection in all samples collected. Extractable iron values were below the Canadian Water Quality Guidelines for the protection of freshwater aquatic life of 0.3 mg/L (as total iron) ranging from 0.10 to 0.19 mg/L.

The Canadian Water Quality Guidelines for metals are expressed as total metals, i.e. the sample has been digested in strong acid to dissolve the silicate matrix present in the water so that the total metal has been accounted for. The Water Quality Branch, Atlantic Region, performs extractable metal analysis using a weak acid which measures only metals dissolved or adsorbed to particulate matter. In this region, total and extractable compare well because of the low suspended sediment load. A sample with a higher sediment load, as indicated by its turbidity, will not have a good relationship between total and extractable metals.

There is no Canadian Water Quality Guideline for the protection of freshwater aquatic life for manganese. At the Kellyland sampling station, manganese was slightly above the detection limit ranging from 0.01 to 0.05 mg/L. Aluminum values ranged from 0.024 to 0.100 mg/L meeting the Canadian Water Quality Guideline of 0.100 mg/L for waters where the pH is greater than 6.5 pH units.

Nutrient concentrations were low at Kellyland with nitrate nitrogen and total nitrogen ranging from <0.01 to 0.07 and 0.12 to 0.34 mg/L respectively. Total phosphorus ranged from 0.005 to 0.013 mg/L while dissolved organic carbon ranged from 3.9 to 7.6 mg/L.

3.4 St. Croix River at Woodland - Station No. 00NB01AR0014

This water quality sampling station is located on the United States side of the river approximately 200 metres below the site of the Georgia-Pacific Mill effluent outfall. Samples are collected in the effluent plume and serve to characterize the chemical composition of the effluent after slight dilution by river water.

The temperature of the St. Croix River at the Woodland station is primarily due to the effluent temperature and thus remains high throughout the year (15.0 to 30.0°C). The lowest dissolved oxygen concentration recorded was 5.6 mg/L representing 75 percent saturation on September 12. pH was slightly higher (7.3-7.7 units) at Woodland as compared to Kellyland due to the alkaline nature of the Kraft effluent. The apparent color was greater than 1000 Hazen units on all occasions, approximately 25 times the background level. Nonfilterable residue (suspended solids) ranged from 32 to 97 mg/L with a median of 63. Values at Kellyland and Milltown are normally less than the detection limit of 10 mg/L.

The specific conductance at Woodland was approximately 70 times higher than the background station. There is also a change in the

major ion chemistry. Whereas at Kellyland, the cation and anion dominance were Ca>Na>Mg>K and HCO_3>SO_4>Cl respectively, sodium strongly dominates the cations followed by Ca>K>Mg (Table 6) at Woodland. Similarly chloride dominates the anions with sulphate and bicarbonate nearly proportional. This shift in ion dominance is a result of the Kraft process.

Mercury and cadmium were below or at their respective detection limits while copper (0.002 to 0.004 mg/L) and lead (0.004 to 0.007 mg/L) were slightly above the detection limit. The Canadian Water Quality Guidelines for copper and lead are dependent on water hardness. At Woodland, the hardness varies from hard to very hard, therefore the guidelines for copper and lead would range from 0.004 to 0.006 mg/L and 0.004 to 0.007 mg/L respectively. Iron concentrations were elevated (0.69 to 1.10 mg/L) while manganese values were about two orders of magnitude greater than those in samples from Kellyland. Extractable aluminum concentrations remain high (2.1 to 4.0 mg/L), which probably results from the use of alum in process water treatment at the mill.

Although iron and aluminum concentrations greatly exceed the water quality guidelines of 0.3 and 0.1 mg/L respectively, the highly organic nature of the effluent would suggest the metals are bound to the organic matter and therefore not readily available to aquatic organisms.

The organic nature of the Kraft Mill effluent is also reflected in the elevated concentrations of nutrients. With the exception of the annomolous value of 1.4 mg/L, dissolved organic carbon (DOC) values ranged from 23 to 71 mg/L in 1989, as compared to 59 to 152 mg/L in 1988.

A comparison of DOC values from 1984 to 1989 indicates that median DOC at Woodland in 1989 was approximately half that of the previous five years. A new recovery boiler, which burns organic bi-products, was put into operation August 1989, however this probably had little bearing on the 1989 data (personal communication - Scott Beal, Georgia-Pacific Corporation). Such a decline in DOC should have yielded significant changes in related parameters such as color and dissolved oxygen. Although there are slight improvements other factors such as river discharge and the very small data set limit the conclusions which one may draw from the data. The DOC data will be closely monitored for the next year.

Total nitrogen and nitrate nitrogen ranged from 2.00 to 5.20 mg/L and 2.10 to 5.50 mg/L respectively. Total phosphorous determinations are not conducted at this station due to analytical interferences associated with the Kraft process.

3.5 St. Croix River at Milltown - Station No. 00NB01AR0001

Fourteen kilometres downstream from Woodland at Milltown, the effluent plume appears to be incorporated into the river water and

there is little indication of any horizontal differentiation in water quality (Hovell and Lockerbie 1983). This station provides information on the river water quality after assimilation of the pulp mill effluent by the river.

Water temperatures (0.5 to 22.0°C) were similar to the background station at Kellyland. Apparent color at Milltown ranged from 40-100 Hazen units which represents an approximate 2-fold increase over the values at Kellyland. Dissolved oxygen exceeded the water quality objectives of 5.0 mg/L and 60% saturation on all occasions. It ranged from 5.7 to 13.0 mg/L and 67 to 93 percent saturation. The lowest dissolved oxygen recorded (5.7 mg/L and 67% sat.) was on August 3, 1989, following the effluent spill discussed earlier.

Major ion chemistry at Milltown reflects a mixture of the background calcium bicarbonate dominated waters of the St. Croix River and the sodium chloride dominated pulp mill effluent. The specific conductance values were variable ranging from 56 to 131 µS/cm. Sodium was the dominant cation over calcium on all occasions. Bicarbonate was the dominant anion on five of seven occasions, but was exceeded by chloride on the other two.

Mercury, lead and cadmium were not detected at Milltown. A single value for copper of 0.004 mg/L was slightly above the Water Quality Guideline of 0.002 mg/L for waters with a hardness of less than 60 mg/L ($CaCO_3$).

At Milltown, iron concentrations were approximately twice those found at Kellyland with values ranging from 0.15 to 0.37 mg/L, the increases presumably the result of the high concentrations observed in the pulp mill effluent. A triplicate sample collected November 2 slightly exceeded the Canadian Water Quality Guideline for iron of 0.3 mg/L with values ranging from 0.36 to 0.37 mg/L. Turbidity values were also higher indicating that the iron may have been associated with particulate matter.

Extractable aluminum exceeded the Candian Water Quality Guideline of 0.1 mg/L on 4 of 7 sampling occasions with values ranging from 0.053 to 0.170 mg/L. As with iron, the highest aluminum concentrations are associated with higher turbidity values.

Nutrient concentrations at Milltown are slightly higher than those observed at Kellyland. Total phosphorus ranged from 0.020 to 0.042 mg/L, nitrite-nitrate from <0.01 to 0.22 mg/L, total nitrogen from 0.14 to 0.43 mg/L and dissolved organic carbon ranged from 4.2 to 8.6 mg/L.

3.6 Milltown AVQM Data

The provisional AVQM data for the period from January to December 1989, and the provisional discharge data have been formatted into monthly data sheets and are provided for information only in Appendix II. It should be noted that the fourth column of each

parameter represents the number of hours of data used in the calculations, hence the confidence that can be placed on the calculated values.

Although data correction factors provided by the USGS for the AWQM at Milltown have been applied to the data on the monthly summary sheets, some very minor discrepancies between the published data (USGS 1990) and monthly summary sheets still remain. The monthly summary data from October to December 1989 are considered provisional.

The small blocks of data in May, August and November were discarded due to operational problems. The former two were caused by programme and pump failure respectively. A Ground Fault Interceptor was tripped in November.

Discharge data for the months of January and December were not received at Moncton. In January, the Water Resources Branch receiving station at Downsview, Ontario was not in alignment with the GEOS satellite and in December, a shifting of the satellite resulted in non-alignment of the Data Collection Platform (DCP) at Baring with the satellite.

Dissolved oxygen (mg/L) and discharge were plotted for the period from July to September in Figure 6. The graph was prepared using the data listed in the July to September monthly summary sheets of which approximately 60% of the dissolved oxygen data agreed with

the published data (USGS, 1990) and the remaining 40% was 0.1 mg/L lover than the published data.

The graph of mean dissolved oxygen for the period from July to September (Figure 6) indicates a rather moderate decline in DO values and a highly variable discharge from mid-July until early August. In early August the broad fluctuation of discharge was due to the release of water in response to the effluent spill of July 30. The relatively high discharge in late August and early September explains the recovery of dissolved oxygen to the 8.0 mg/L plateau.

4. CONCLUSIONS

During the study period, from February to December 1989, the sampling sites were visited on seven occasions. Dissolved oxygen and pH were in compliance with the established Water Quality Objectives at all sites. Iron and alulminum exceeded the Canadian Water Guidelines for the protection of freshwater aquatic at both Woodland and Milltown.

The AWQM provisional data for the period from January, 1989 to December, 1989 have been appended for information. These data have been corrected for technical errors with factors supplied by the USGS. The corrected AWQM data also met the Water Quality Objectives for both dissolved oxygen and pH.

5. RECOMMENDATION

The Water Quality Branch monitoring data for the period from 1982 to 1989 indicate that extractable iron and aluminum at Woodland and Milltown have exceeded the Canadian Water Quality Guidelines for the protection of aquatic life.

It is recommended that the St. Croix River Advisory Board on Pollution Control consider the development of Water Quality objectives for iron and aluminum in the St. Croix River Basin.

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TABLE 1

NAQUADAT IDENTIFICATION NUMBERS AND SITE DESCRIPTIONS OF STATIONS SAMPLED ON THE ST. CROIX RIVER

NAQUADAT No.	Site Description
00NB01AR0013	St. Croix River at Kellyland
00NB01AR0014	St. Croix River, 200 m below Woodland Mill on the U.S. side of the river.
00NB01AR0001	St. Croix River at Milltown International bridge - mid-river.

TABLE 2

A LIST OF PARAMETERS, PARAMETER CODES AND DETECTION LIMITS

Parameter	NAQUADAT Code	Detection Limit
Water Temperature	02065S	--
Dissolved Oxygen (meter)	08102S	--
Specific Cond. (field)	02042S	2 µS/cm
pH (field)	10301F	-
Specific Cond. (lab.)	02041L	0.2 µS/cm
pH (lab)	10301L	--
Colour	02011L	--
Turbidity	02073L	--
Calcium	20110L	0.040 mg/L
Sodium	11103L	0.10 mg/L
Potassium	19103L	0.10 mg/L
Magnesium	12107L	0.005 mg/L
Chloride	17209L	0.100 mg/L
Sulphate	16304L	1.00 mg/L
Total Alkalinity	10101L	0.5 mg/L
Extractable Iron	26304L	0.050 mg/L
Extractable Manganese	25304L	0.010 mg/L
Extractable Copper	29305L	0.002 mg/L
Extractable Lead	82302L	0.002 mg/L
Extractable Mercury	80315L	0.02 µg/L
Extractable Aluminum	13305L	0.002 mg/L
Extractable Cadmium	48302L	0.001 mg/L
Total Phosphorus	15413L	0.005 mg/L
Total Nitrogen	07601L	0.025 mg/L
Nitrate + Nitrite N.	07110L	0.002 mg/L
Dissolved Organic Carbon	06107L	0.4 mg/L

TABLE 3

PHYSICAL PARAMETERS AND MAJOR ION CONCENTRATIONS (MG/L)
FOR THE ST. CROIX RIVER STATIONS AT KELLYLAND,
WOODLAND AND MILLTOWN

0	1 STN	2 SDATE	3 STIME	4 SUBID	5 WATER TEMP	6 D.O. MG/L	7 D.O. % SAT	8 FIELD PH	9 LAB PH	10 FIELD SP COND	11 LAB SP COND	12 COLOUR
1	00NB01AR0013	23-FEB-89	940	145	0.6	13.3	96	6.90	6.6	34.0	35	25
2	00NB01AR0013	20-APR-89	1215	145	3.5	13.0	101	6.10	6.6	24.0	30	35
3	00NB01AR0013	22-JUN-89	1150	145	21.0	8.0	92	6.70	6.6	32.0	30	70
4	00NB01AR0013	03-AUG-89	1201	145	22.0	7.6	89	7.00	6.7	29.0	30	30
5	00NB01AR0013	12-SEP-89	1340	145	21.0	8.0	92	6.30	6.7	27.5	30	20
6	00NB01AR0013	02-NOV-89	1250	145	11.0	10.4	97	7.72	6.9	46.8	36	40
7	00NB01AR0013	07-DEC-89	930	T145	1.5			6.37	6.6	29.1	34	50
8	00NB01AR0013	07-DEC-89	935	T145	1.5			6.36	6.5	29.1	34	50
9	00NB01AR0013	07-DEC-89	931	T145	1.5			6.33	6.5	29.1	34	50
10												
11	00NB01AR0014	23-FEB-89	1030	T145	16.8	9.2	98	7.60		2640.0	2760	G1000.
12	00NB01AR0014	23-FEB-89	1035	T145	16.8	9.2	98	7.80		2640.0	2740	G1000.
13	00NB01AR0014	23-FEB-89	1040	T145	16.8	9.2	98	7.80		2640.0	2750	G1000.
14	00NB01AR0014	20-APR-89	1320	T145	17.5	7.8	84	7.50	7.6	2250.0	2250	G1000.
15	00NB01AR0014	20-APR-89	1325	T145	17.5	7.8	84	7.50	7.5	2250.0	2220	G1000.
16	00NB01AR0014	20-APR-89	1330	T145	17.5	7.8	84	7.50	7.5	2250.0	2250	G1000.
17	00NB01AR0014	22-JUN-89	1230	145	29.0	6.4	84	7.50	7.6	2100.0	2060	G1000.
18	00NB01AR0014	03-AUG-89	1201	145	30.0	6.0	80	7.90	7.3	2170.0	2230	G1000.
19	00NB01AR0014	12-SEP-89	1520	T145	30.0	5.6	75	7.40		1970.0	2200	G1000.
20	00NB01AR0014	12-SEP-89	1530	T145	30.0	5.6	75	7.39		1970.0	2200	G1000.
21	00NB01AR0014	12-SEP-89	1540	T145	30.0	5.6	75	7.40		1970.0	2200	G1000.
22	00NB01AR0014	02-NOV-89	1345	145	25.0	6.0	74	6.40	7.7	2660.0	2190	G1000.
23	00NB01AR0014	07-DEC-89	1050	145	15.0	10.6	108	7.70	7.3	1698.0	2300	G1000.
24												
25	00NB01AR0001	23-FEB-89	1130	145	0.5	13.0	93	7.80	6.8	124.0	131	100
26	00NB01AR0001	20-APR-89	1430	145	8.5	10.3	91	6.50	6.7	56.0	56	45
27	00NB01AR0001	22-JUN-89	1300	T145	21.0	8.0	92	6.90	6.8	67.0	62	90
28	00NB01AR0001	22-JUN-89	1305	T145	21.0	8.0	92	6.80	6.8	67.0	62	90
29	00NB01AR0001	22-JUN-89	1310	T145	21.0	8.0	92	6.80	6.8	67.0	62	90
30	00NB01AR0001	03-AUG-89	1201	145	22.0	5.7	67	6.90	6.8	73.0	68	60
31	00NB01AR0001	12-SEP-89	1620	145	21.0	7.9	91	6.40	6.8	57.1	57	40
32	00NB01AR0001	02-NOV-89	1450	T145	10.0	10.4	95	6.54	6.9	121.0	92	100
33	00NB01AR0001	02-NOV-89	1455	T145	10.0			6.56	6.8	118.0	92	100
34	00NB01AR0001	02-NOV-89	1457	T145	10.0			6.54	6.8	117.0	92	100
35	00NB01AR0001	07-DEC-89	1300	145	0.5			6.90	6.7	76.0	79	80

TABLE 3

PHYSICAL PARAMETERS AND MAJOR ION CONCENTRATIONS (MG/L)
FOR THE ST. CROIX RIVER STATIONS AT KELLYLAND,
WOODLAND AND MILLTOWN

0	13 TURBIDITY JTU	14 T ALKAL MG/L	15 DISS CA MG/L	16 DISS MG MG/L	17 DISS K MG/L	18 DISS NA MG/L	19 DISS SO4 MG/L	20 SO4-IC MG/L	21 DISS CL MG/L	22 NF RES MG/L	
1	0.5	9.1	3.4	0.70	0.37	1.7	4.2	3.7	1.9	L10.	
2	0.8	6.7	2.7	0.58	0.47	1.6	3.6	3.2	2.2		
3	0.7	7.2	3.2	0.63	0.43	1.4	3.2	2.7	1.2	L10.	
4	0.5	7.7	3.2	0.60	0.42	1.5	3.3	3.0	1.7	L10.	
5	0.5	7.0	3.1	0.48	0.40	1.5		3.1	1.5	L10.	
6	0.8	8.7	3.8	0.66	0.35	1.6		3.3	1.8	L10.	
7	0.7	7.3	3.7	0.70	0.43	1.9		3.3	2.0	L10.	
8	0.9	6.3	3.4	0.78	0.38	1.9		3.4	2.0		
9	0.9	6.3	3.8	0.78	0.38	1.9		3.3	2.0		
10											
11	3.2		79.0	6.20	26.20	531.0	328.6	310.0	580.0		97
12	3.4		80.0	6.30	28.00	535.0	330.8	310.0	580.0		
13	3.1		79.0	6.20	27.80	535.0	322.2	300.0	580.0		
14	6.9	286.6	58.0	4.40	25.00	450.0	295.0	280.0	390.0		33
15	6.6	285.3	58.0	4.40	24.00	430.0	295.0	270.0	380.0		36
16	6.5	288.8	58.0	4.40	25.00	440.0	305.0	280.0	390.0		38
17	5.1	240.0	52.0	4.30	13.00	370.0	182.1	226.0	455.0		48
18	2.7	325.0	56.0	4.00	22.00	440.0	300.0	291.3	331.0		70
19	5.1		71.0	4.60	15.30	440.0	330.0	343.7	386.0		74
20	5.4		69.0	4.50	16.00	438.0	350.0	343.1	386.0		63
21	5.5		74.0	4.50	16.00	442.0	350.0	340.0	381.0		72
22	2.9	286.3	50.0	4.20	18.10	410.0		219.5	396.0		32
23	4.2	263.7	81.0	4.50	1.40	415.0		309.8	353.0		75
24											
25	3.9	17.2	5.8	0.93	1.30	17.2	12.5	12.2	17.6	L10.	
26	1.1	9.1	3.6	0.69	0.80	5.6	6.9	5.6	5.8	L10.	
27	1.2	10.3	3.9	0.71	0.63	6.9	6.0	4.6	6.2	L10.	
28	1.1	10.5	4.0	0.69	0.69	7.1	5.5	5.1	6.6	L10.	
29	1.2	10.3	4.0	0.69	0.61	7.1	5.3	4.5	6.3	L10.	
30	1.2	12.4	4.4	0.62	0.67	7.7	7.4	7.2	6.4	L10.	
31	0.7	9.3	4.0	0.54	0.57	5.9	6.8	6.3	5.2	L10.	
32	2.3	14.2	5.3	0.95	1.00	11.6		8.4	11.2	L10.	
33	2.0	13.9	4.9	1.00	0.97	11.5		8.2	10.9		
34	2.1	13.9	4.9	1.10	0.97	11.4		8.3	10.9		
35	1.5	13.5	5.7	0.83	0.55	8.4		7.6	8.3	L10.	

TABLE 4

NUTRIENT CONCENTRATIONS (MG/L) FOR THE ST. CROIX RIVER
STATIONS AT KELLYLAND, WOODLAND AND MILLTOWN

0	1 STN	2 SDATE	3 STIME	4 06107 DOC	5 07110 NO3 NO2		6 07601 TN	7 15413 T PHOS
1	00NB01AR0013	23-FEB-89	940	4.9		0.03	0.12	0.005
2	00NB01AR0013	20-APR-89	1215	5.0		0.07	0.12	0.011
3	00NB01AR0013	22-JUN-89	1150	6.9		0.04	0.34	0.013
4	00NB01AR0013	03-AUG-89	1201	4.3	L.01		0.21	0.009
5	00NB01AR0013	12-SEP-89	1340	3.9	L.01		0.19	0.007
6	00NB01AR0013	02-NOV-89	1250	5.2	L.01		0.29	0.008
7	00NB01AR0013	07-DEC-89	930	7.6		0.02	0.17	0.012
8	00NB01AR0013	07-DEC-89	935	7.6	L.01		0.16	0.010
9	00NB01AR0013	07-DEC-89	931	7.2	L.01		0.16	0.007
10								
11	00NB01AR0014	23-FEB-89	1030	23.0		2.10	2.10	
12	00NB01AR0014	23-FEB-89	1035	24.0		4.90	2.00	
13	00NB01AR0014	23-FEB-89	1040	25.0		4.20	2.70	
14	00NB01AR0014	20-APR-89	1320	35.0		5.50	4.20	
15	00NB01AR0014	20-APR-89	1325	36.0		5.10	4.00	
16	00NB01AR0014	20-APR-89	1330	35.0		4.20	4.10	
17	00NB01AR0014	22-JUN-89	1230	57.0		3.30	5.20	
18	00NB01AR0014	03-AUG-89	1201	71.0		2.10	3.90	
19	00NB01AR0014	12-SEP-89	1520	61.0		3.40	3.80	
20	00NB01AR0014	12-SEP-89	1530	61.0		3.30	3.50	
21	00NB01AR0014	12-SEP-89	1540	65.0		3.30	4.20	
22	00NB01AR0014	02-NOV-89	1345	1.4		3.40	3.50	1.000
23	00NB01AR0014	07-DEC-89	1050	61.0		2.65	3.80	
24								
25	00NB01AR0001	23-FEB-89	1130	6.3		0.22	0.29	0.042
26	00NB01AR0001	20-APR-89	1430	4.2		0.09	0.14	0.022
27	00NB01AR0001	22-JUN-89	1300	7.6		0.12	0.40	0.022
28	00NB01AR0001	22-JUN-89	1305	7.5		0.04	0.41	0.021
29	00NB01AR0001	22-JUN-89	1310	7.3		0.06	0.38	0.031
30	00NB01AR0001	03-AUG-89	1201	5.2		0.08	0.28	0.025
31	00NB01AR0001	12-SEP-89	1620	4.7	L.01		0.22	0.020
32	00NB01AR0001	02-NOV-89	1450	7.4		0.05	0.42	0.025
33	00NB01AR0001	02-NOV-89	1455	7.2		0.05	0.43	0.027
34	00NB01AR0001	02-NOV-89	1457	7.1		0.19	0.41	0.022
35	00NB01AR0001	07-DEC-89	1300	8.6		0.08	0.26	0.022

TABLE 5

METAL CONCENTRATIONS (MG/L) FOR THE ST.CROIX RIVER
STATIONS AT KELLYLAND, WOODLAND AND MILLTOWN

0	1 STN	2 SDATE	3 STIME	4 29305 COPPER	5 82302 LEAD	6 48302 CADMIUM	7 80315 MERCURY	8 13305 Al	9 26304 IRON	10 25304 Mn
1	00NB01AR0013	23-FEB-89	940	L.002	L.002	L.001	L.02	0.042	0.10	L.01
2	00NB01AR0013	20-APR-89	1215	L.002	L.002	L.001	L.02	0.060	0.12	0.05
3	00NB01AR0013	22-JUN-89	1150	L.002	L.002	L.001	L.02	0.076	0.19	0.04
4	00NB01AR0013	03-AUG-89	1201	L.002	L.002	L.001	L.02	0.027	0.15	0.03
5	00NB01AR0013	12-SEP-89	1340	L.002	L.002	L.001	L.02	0.024	0.10	L.010
6	00NB01AR0013	02-NOV-89	1250	L.002	L.002	L.001	L.02	0.044	0.18	0.02
7	00NB01AR0013	07-DEC-89	930	L.002	L.002	L.001	L.02	0.100	0.14	0.02
8	00NB01AR0013	07-DEC-89	935	L.002	L.002	L.001	L.02	0.100	0.16	0.02
9	00NB01AR0013	07-DEC-89	931	L.002	L.002	L.001	L.02	0.100	0.16	0.02
10										
11	00NB01AR0014	23-FEB-89	1030	0.003	0.007	0.001	L.02	2.500	0.71	2.30
12	00NB01AR0014	23-FEB-89	1035	0.003	0.007	0.001	L.02	2.500	0.73	2.30
13	00NB01AR0014	23-FEB-89	1040	0.003	0.007	0.001	L.02	2.500	0.73	2.30
14	00NB01AR0014	20-APR-89	1320				L.02	2.100	0.71	1.90
15	00NB01AR0014	20-APR-89	1325				L.02	2.100	0.73	2.00
16	00NB01AR0014	20-APR-89	1330				L.02	2.100	0.75	1.90
17	00NB01AR0014	22-JUN-89	1230	0.003	0.005	0.001	L.02	3.300	0.69	1.90
18	00NB01AR0014	03-AUG-89	1201	0.004	0.005	0.001	L.02	3.500	0.96	1.90
19	00NB01AR0014	12-SEP-89	1520	0.004	0.006	0.002	L.02	3.300	1.00	2.20
20	00NB01AR0014	12-SEP-89	1530	0.004	0.005	0.002	L.02	3.300	1.10	2.20
21	00NB01AR0014	12-SEP-89	1540	0.004	0.005	0.002	L.02	3.300	1.00	2.20
22	00NB01AR0014	02-NOV-89	1345	0.002	0.004	0.001	L.02	2.100	0.70	1.30
23	00NB01AR0014	07-DEC-89	1050	0.004	0.005	0.001	L.02	4.000	0.80	1.80
24										
25	00NB01AR0001	23-FEB-89	1130	L.002	L.002	L.001	L.02	0.170	0.26	0.10
26	00NB01AR0001	20-APR-89	1430	L.002	L.002	L.001	L.02	0.095	0.20	0.07
27	00NB01AR0001	22-JUN-89	1300	L.002	L.002	L.001	L.02	0.110	0.23	0.07
28	00NB01AR0001	22-JUN-89	1305	L.002	L.002	L.001	L.02	0.120	0.25	0.06
29	00NB01AR0001	22-JUN-89	1310	L.002	L.002	L.001	L.02	0.120	0.23	0.06
30	00NB01AR0001	03-AUG-89	1201	0.004	L.002	L.001	L.02	0.089	0.23	0.06
31	00NB01AR0001	12-SEP-89	1620	L.002	L.002	L.001	L.02	0.053	0.15	0.04
32	00NB01AR0001	02-NOV-89	1450	L.002	L.002	L.001	L.02	0.150	0.36	0.04
33	00NB01AR0001	02-NOV-89	1455	L.002	L.002	L.001	L.02	0.150	0.37	0.04
34	00NB01AR0001	02-NOV-89	1457	L.002	L.002	L.001	L.02	0.160	0.36	0.04
35	00NB01AR0001	07-DEC-89	1300	L.002	L.002	L.001	L.02	0.160	0.20	0.04

TABLE 6
MAJOR ION EQUIVALENT CONCENTRATIONS (MEQ/L)
FOR THE ST. CROIX RIVER STATIONS AT
KELLYLAND, WOODLAND AND MILLTOWN

0	1 STATION	2 SAMPLING DATE	3 CA MEQ/L	4 MG MEQ/L	5 NA MEQ/L	6 K MEQ/L	7 CL MEQ/L	8 SO4 MEQ/L	9 HCO3 MEQ/L
1	00NB01AR0013	23-FEB-89	0.16966	0.057582	0.143395	0.009461	0.053599	0.077034	0.181818
2	00NB01AR0013	20-APR-89	0.13473	0.047711	0.134960	0.012018	0.062062	0.066624	0.133866
3	00NB01AR0013	22-JUN-89	0.15968	0.051824	0.118090	0.010995	0.033852	0.056214	0.143856
4	00NB01AR0013	03-AUG-89	0.15968	0.049356	0.126525	0.010739	0.047957	0.062460	0.153846
5	00NB01AR0013	12-SEP-89	0.15469	0.039485	0.126525	0.010228	0.042315	0.064542	0.139860
6	00NB01AR0013	02-NOV-89	0.18962	0.054292	0.134960	0.008950	0.050778	0.068706	0.173826
7	00NB01AR0013	07-DEC-89	0.18463	0.057582	0.160265	0.010995	0.056420	0.068706	0.145854
8	00NB01AR0013	07-DEC-89	0.16966	0.064163	0.160265	0.009717	0.056420	0.070788	0.125874
9	00NB01AR0013	07-DEC-89	0.18962	0.064163	0.160265	0.009717	0.056420	0.068706	0.125874
10									
11	00NB01AR0014	23-FEB-89	3.94210	0.510012	44.789850	0.669934	16.361800	6.454200	
12	00NB01AR0014	23-FEB-89	3.99200	0.518238	45.127250	0.715960	16.361800	6.454200	
13	00NB01AR0014	23-FEB-89	3.94210	0.510012	45.127250	0.710846	16.361800	6.246000	
14	00NB01AR0014	20-APR-89	2.89420	0.361944	37.957500	0.639250	11.001900	5.829600	5.726268
15	00NB01AR0014	20-APR-89	2.89420	0.361944	36.270500	0.613680	10.719800	5.621400	5.700294
16	00NB01AR0014	20-APR-89	2.89420	0.361944	37.114000	0.639250	11.001900	5.829600	5.770224
17	00NB01AR0014	22-JUN-89	2.59480	0.353718	31.209500	0.332410	12.835550	4.705320	4.795200
18	00NB01AR0014	03-AUG-89	2.79440	0.329040	37.114000	0.562540	9.337510	6.064866	6.493500
19	00NB01AR0014	12-SEP-89	3.54290	0.378396	37.114000	0.391221	10.889060	7.155834	
20	00NB01AR0014	12-SEP-89	3.44310	0.370170	36.945300	0.409120	10.889060	7.143342	
21	00NB01AR0014	12-SEP-89	3.69260	0.370170	37.282700	0.409120	10.748010	7.078800	
22	00NB01AR0014	02-NOV-89	2.49500	0.345492	34.583500	0.462817	11.171160	4.569990	5.720274
23	00NB01AR0014	07-DEC-89	4.04190	0.370170	35.005250	0.035798	9.958130	6.450036	5.268726
24									
25	00NB01AR0001	23-FEB-89	0.28942	0.076502	1.450820	0.033241	0.496496	0.254004	0.343656
26	00NB01AR0001	20-APR-89	0.17964	0.056759	0.472360	0.020456	0.163618	0.116592	0.181818
27	00NB01AR0001	22-JUN-89	0.19461	0.058405	0.582015	0.016109	0.174902	0.095772	0.205794
28	00NB01AR0001	22-JUN-89	0.19960	0.056759	0.598885	0.017643	0.186186	0.106182	0.209790
29	00NB01AR0001	22-JUN-89	0.19960	0.056759	0.598885	0.015598	0.177723	0.093690	0.205794
30	00NB01AR0001	03-AUG-89	0.21956	0.051001	0.649495	0.017643	0.180544	0.149904	0.247752
31	00NB01AR0001	12-SEP-89	0.19960	0.044420	0.497665	0.014575	0.146692	0.131166	0.185814
32	00NB01AR0001	02-NOV-89	0.26447	0.078147	0.978460	0.025570	0.315952	0.174888	0.283716
33	00NB01AR0001	02-NOV-89	0.24451	0.082260	0.970025	0.024803	0.307489	0.170724	0.277722
34	00NB01AR0001	02-NOV-89	0.24451	0.090486	0.961590	0.024803	0.307489	0.172806	0.277722
35	00NB01AR0001	07-DEC-89	0.26443	0.068276	0.708540	0.014064	0.234143	0.158232	0.269730

TABLE 7
QUALITY CONTROL SAMPLE BLANKS
FOR METALS AND PHOSPHORUS

0	1 STN	2 SAMPLE	3 SDATE	4 15413 T PHOS	5 29305 COPPER	6 82302 LEAD	7 48302 CADMIUM	8 80315 MERCURY	9 13305 Al	10 25304 Mn
1	00NB01AR9901	803472	23-FEB-89	L.001	L.002	L.002	L.001	L.02	L.010	L.01
2	00NB01AR9901	900835	22-JUN-89	L.001	L.002	L.002	L.001	L.02	L.010	L.01
3	00NB01AR9901	901668	03-AUG-89	L.001	L.002	L.002	L.001		L.010	L.010
4	00NB01AR9901	902175	12-SEP-89	L.001	L.002	L.002	L.001	L.02	L.010	L.010
5	00NB01AR9901	902835	02-NOV-89	L.001	L.002	L.002	L.001	L.02	L.010	L.010
6	00NB01AR9901	903227	07-DEC-89	L.001	L.002	L.002	L.001	L.02	L.010	L.010

TABLE 8

GUIDELINES FOR FRESHWATER AQUATIC LIFE AS TOTAL METALS (CCREM, 1987)

Parameter	Guideline	Comments
Aluminum	0.005 $mg.L^{-1}$	$pH<6.5$; $(Ca^{2+})<4.0$ $mg.L^{-1}$; $DOC<2.0$ $mg.L^{-1}$
	0.1 $mg.L^{-1}$	$pH\geq6.5$; $(Ca^{2+})>4.0$ $mg.L^{-1}$; $DOC\geq2.0$ $mg.L^{-1}$
Arsenic	0.05 $mg.L^{-1}$	
Cadmium	0.2 $\mu g.L^{-1}$	Hardness 0-60 $mg.L^{-1}$ ($CaCO_3$)
	0.8 $\mu g.L^{-1}$	Hardness 60-120 $mg.L^{-1}$ ($CaCO_3$)
	1.3 $\mu g.L^{-1}$	Hardness 120-180 $mg.L^{-1}$ ($CaCO_3$)
	1.8 $\mu g.L^{-1}$	Hardness > 180 $mg.L^{-1}$ ($CaCO_3$)
Copper	2 $\mu g.L^{-1}$	Hardness 0-60 $mg.L^{-1}$ ($CaCO_3$)
	2 $\mu g.L^{-1}$	Hardness 60-120 $mg.L^{-1}$ ($CaCO_3$)
	4 $\mu g.L^{-1}$	Hardness 120-180 $mg.L^{-1}$ ($CaCO_3$)
	6 $\mu g.L^{-1}$	Hardness > 180 $mg.L^{-1}$ ($CaCO_3$)
Iron	0.3 $mg.L^{-1}$	
Lead	1 $\mu g.L^{-1}$	Hardness 0-60 $mg.L^{-1}$ ($CaCO_3$)
	2 $\mu g.L^{-1}$	Hardness 60-120 $mg.L^{-1}$ ($CaCO_3$)
	4 $\mu g.L^{-1}$	Hardness 120-180 $mg.L^{-1}$ ($CaCO_3$)
	7 $\mu g.L^{-1}$	Hardness > 180 $mg.L^{-1}$ ($CaCO_3$)
Zinc	0.03 $mg.L^{-1}$	

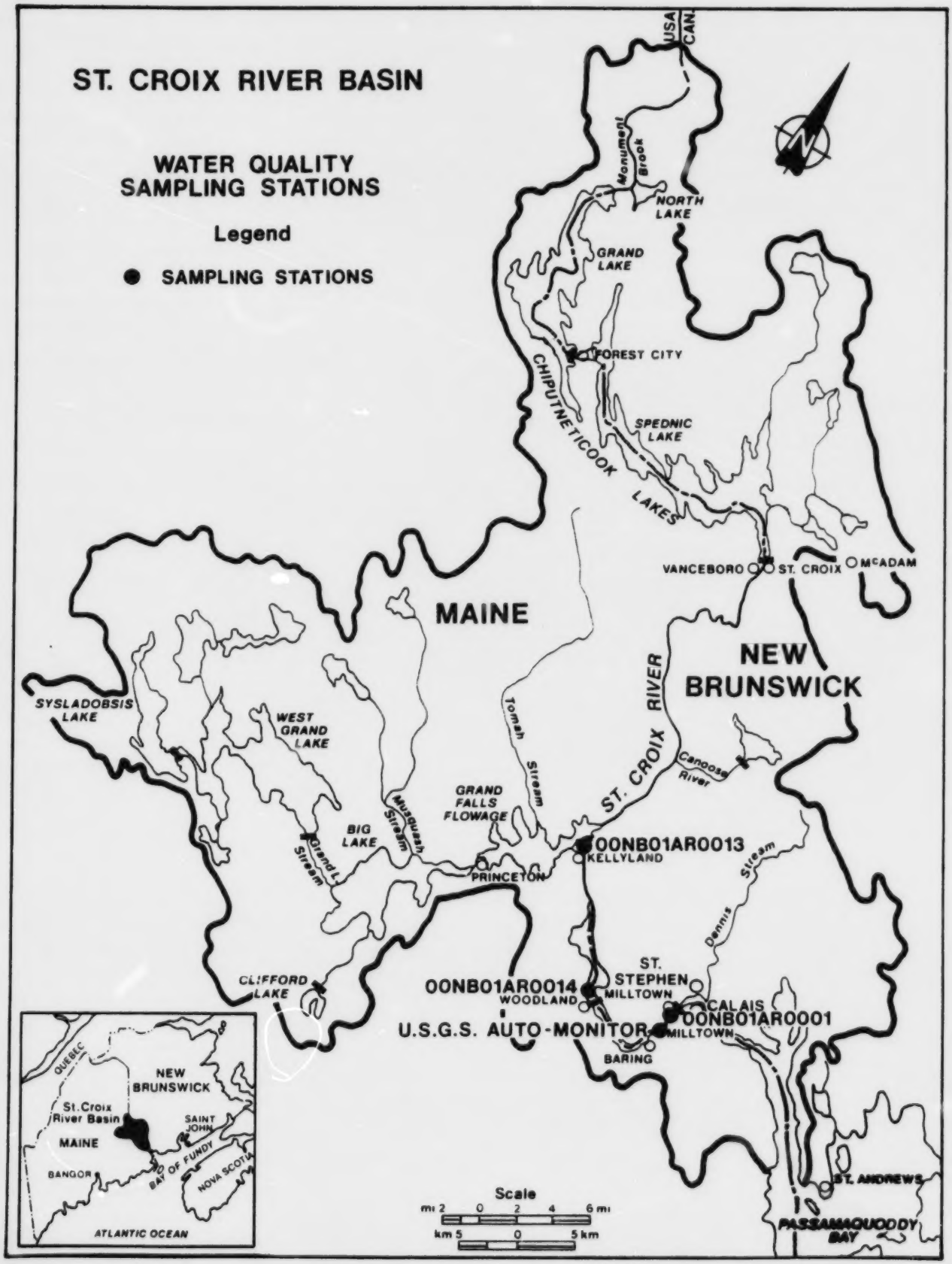

ST. CROIX RIVER BASIN
WATER QUALITY SAMPLING STATIONS
Legend
SAMPLING STATIONS
USA
CAN
Monument Brook
NORTH LAKE
GRAND LAKE
FOREST CITY
CHIPUTNETICOOK LAKES
SPEDNIC LAKE
VANCEBORO
ST. CROIX
McADAM
MAINE
NEW BRUNSWICK
ST. CROIX RIVER
SYSLADOBSIS LAKE
WEST GRAND LAKE
Tomah Stream
Canoose River
GRAND FALLS FLOWAGE
Musquash Stream
Grand L. Stream
BIG LAKE
00NB01AR0013
KELLYLAND
PRINCETON
Dennis Stream
CLIFFORD LAKE
00NB01AR0014
WOODLAND
ST. STEPHEN
MILLTOWN
CALAIS
00NB01AR0001
U.S.G.S. AUTO-MONITOR
MILLTOWN
BARING
ST. ANDREWS
PASSAMAQUODDY BAY
QUEBEC
NEW BRUNSWICK
St. Croix River Basin
SAINT JOHN
MAINE
BANGOR
BAY OF FUNDY
NOVA SCOTIA
ATLANTIC OCEAN
Scale
mi 2 0 2 4 6 mi
km 5 0 5 km

Figure 1

FIGURE 2
DISSOLVED OXYGEN (MG/L) AT ST. CROIX RIVER
SAMPLING STATIONS - WQB GRAB SAMPLES
FEBRUARY 1989 TO DECEMBER 1989

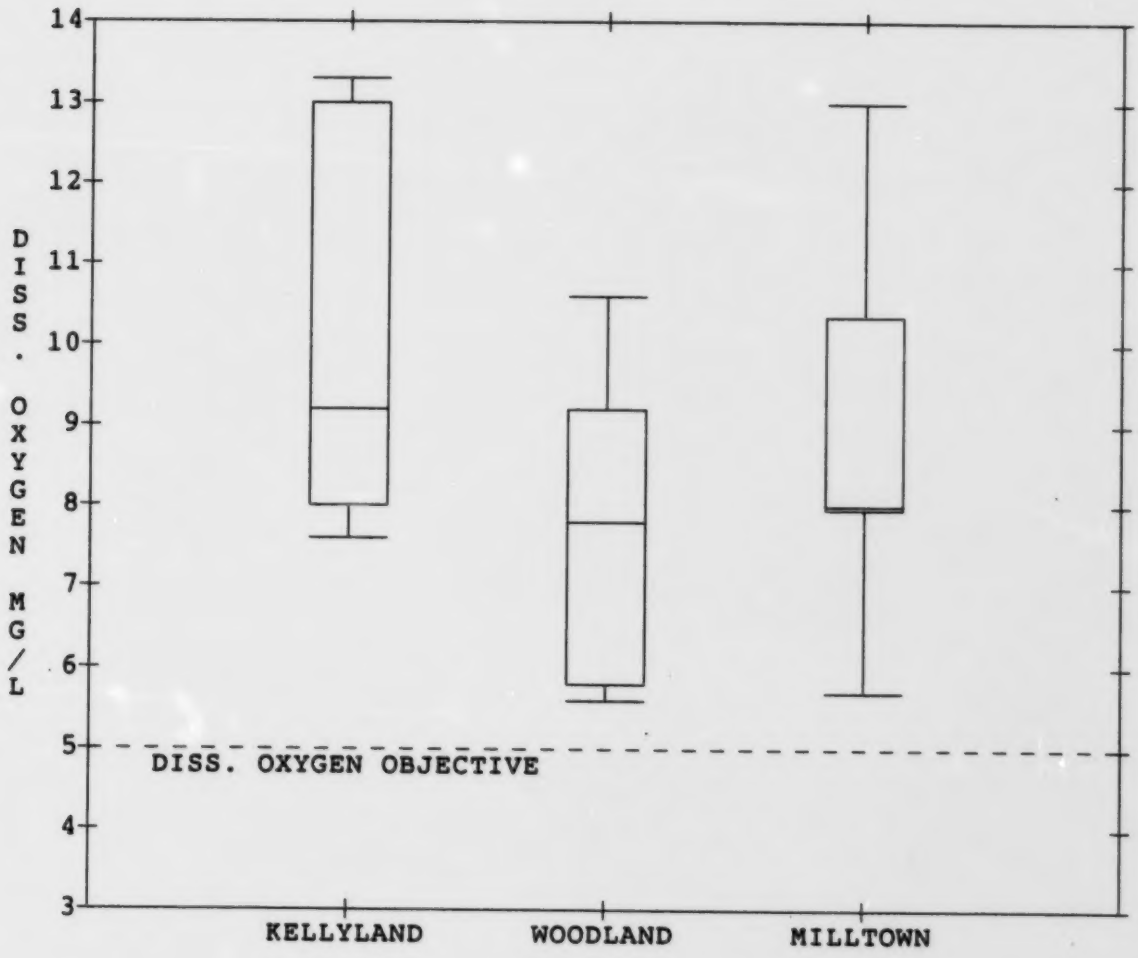


FIGURE 3
DISSOLVED OXYGEN (% SATURATION) AT ST. CROIX RIVER
SAMPLING STATIONS - WQB GRAB SAMPLES
FEBRUARY 1989 TO DECEMBER 1989

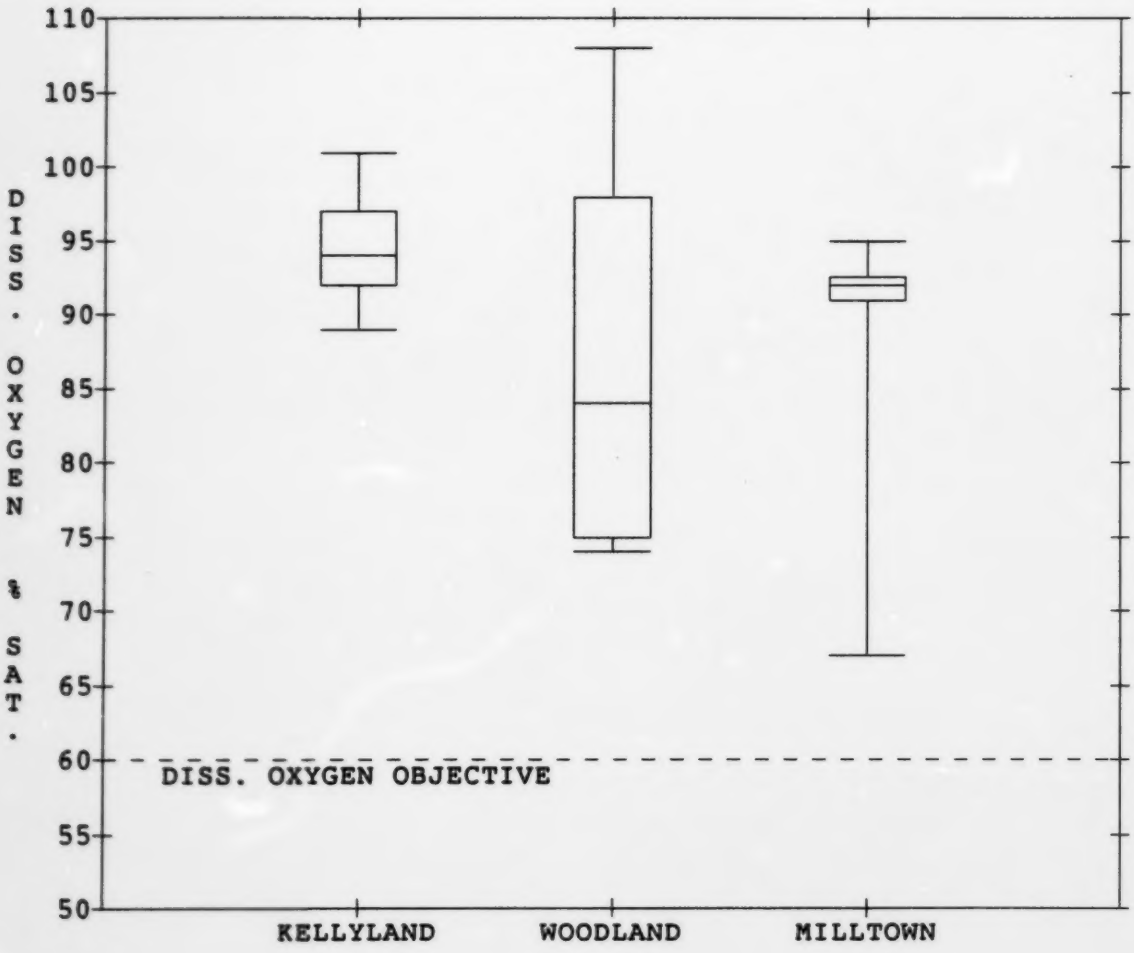


FIGURE 4
pH AT ST. CROIX RIVER SAMPLING STATIONS
WQB GRAB SAMPLES - FEBRUARY TO DECEMBER 1989

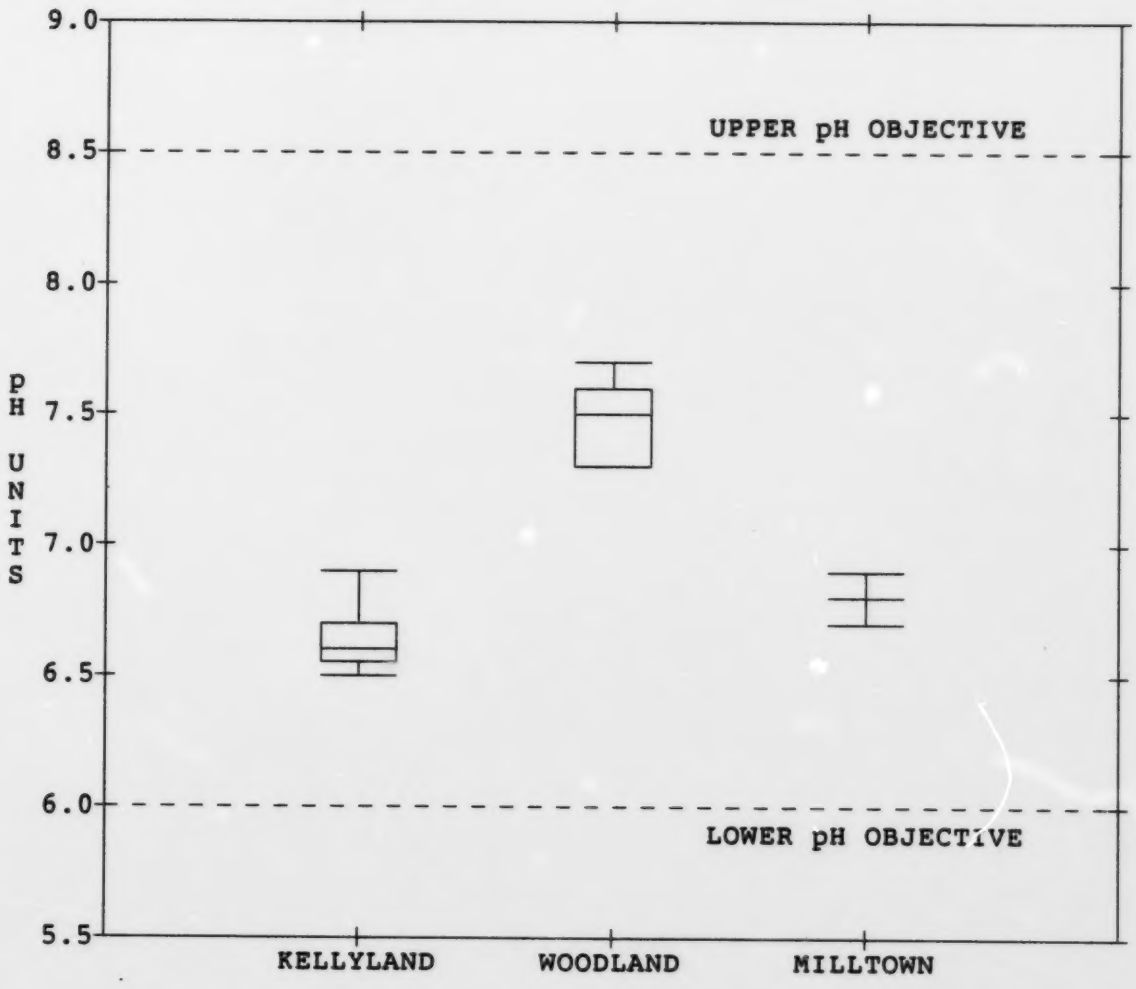


FIGURE 5
ST. CROIX RIVER AT MILLTOWN AWQM DATA
MEAN DISSOLVED OXYGEN (MG/L) FOR
JULY,AUGUST AND SEPTEMBER,1989

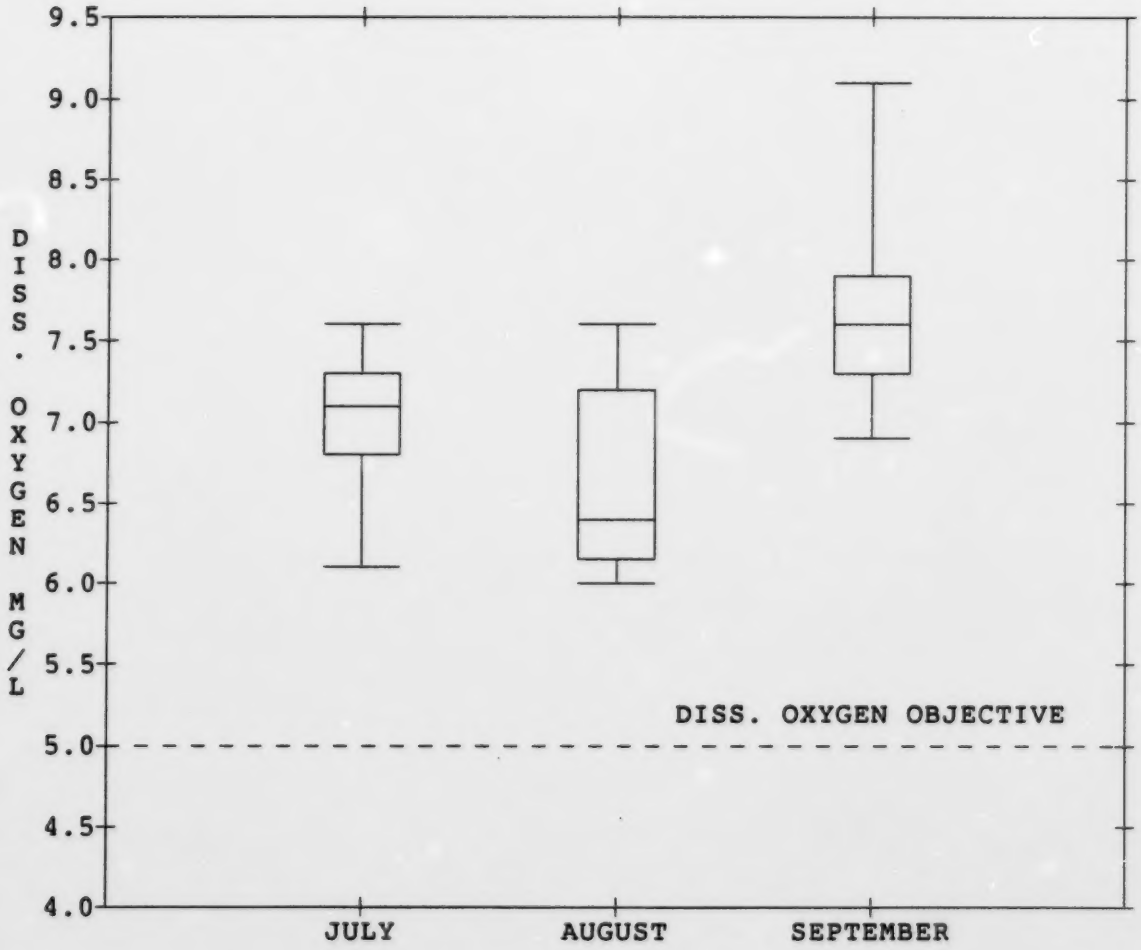
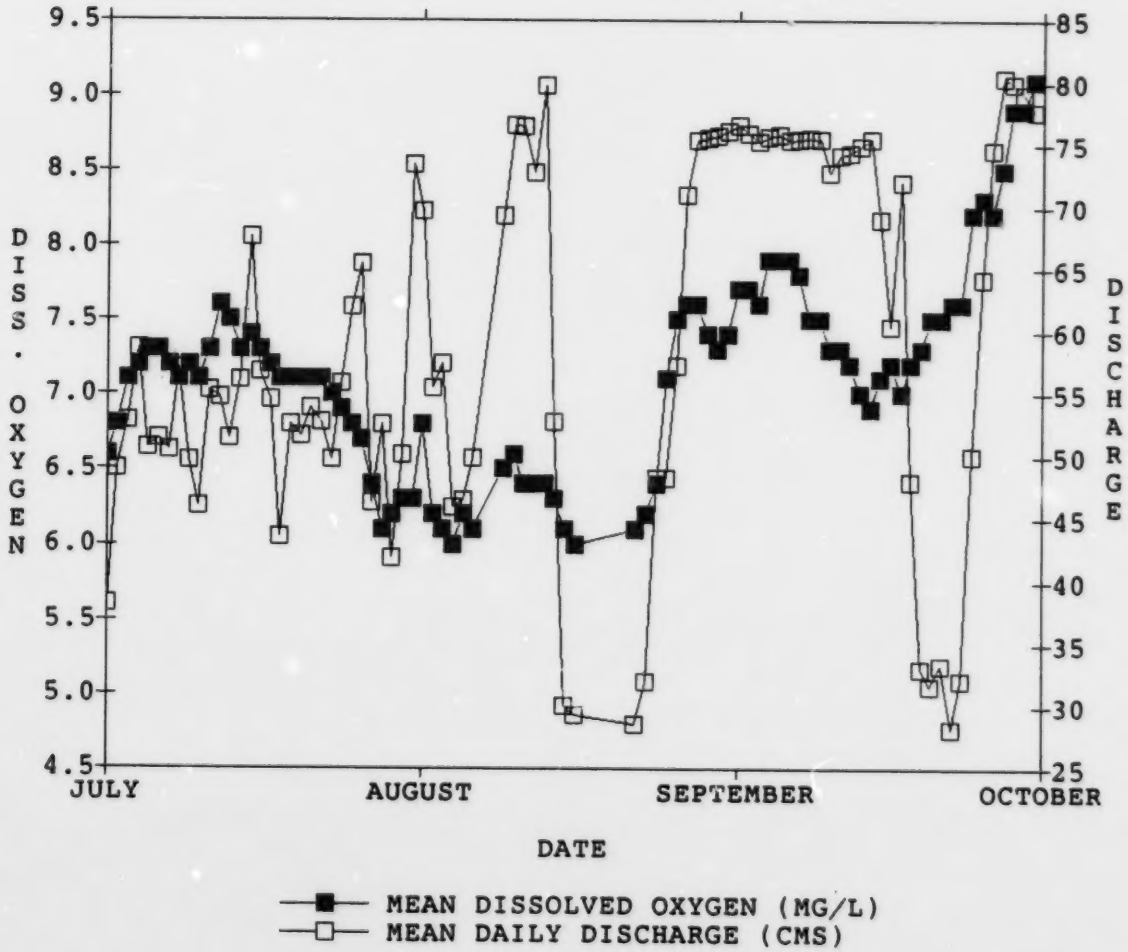


FIGURE 6
ST. CROIX RIVER AT MILLTOWN AWQM DATA
(JULY 1 TO SEPTEMBER 30,1989)
MEAN DISSOLVED OXYGEN (MG/L) AND MEAN DAILY DISCHARGE (CMS)



APPENDIX I

SUMMARY OF DAILY AWQM VALUES FOR THE

ST. CROIX RIVER AT MILLTOWN

SUMMARY OF DAILY ANOM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-JAN-89 to 31-JAN-89

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-JAN-89	0.4	0.4	0.4	12	7.1	7.1	7.1	12	105.5	107.1	109.4	12
2-JAN-89	0.0	0.4	0.4	24	7.1	7.1	7.1	24	101.6	105.1	105.5	24
3-JAN-89	0.0	0.4	0.4	18	7.1	7.1	7.2	18	101.6	103.3	105.5	18
4-JAN-89	0.0	0.3	0.4	24	7.1	7.1	7.2	24	101.6	102.4	105.5	24
5-JAN-89	0.0	0.0	0.4	24	7.1	7.2	7.3	24	105.5	121.4	140.6	24
6-JAN-89	0.0	0.2	0.4	21	7.1	7.1	7.2	21	97.6	102.5	113.3	21
7-JAN-89	0.0	0.3	0.4	24	7.0	7.1	7.2	24	82.0	93.4	121.1	24
8-JAN-89	0.0	0.3	0.4	24	7.1	7.1	7.1	24	89.8	113.9	343.7	24
9-JAN-89	0.0	0.4	0.4	18	7.2	7.2	7.2	18	97.6	109.8	128.9	18
10-JAN-89	0.0	0.3	0.4	18	7.2	7.2	7.3	18	128.9	134.3	140.6	18
11-JAN-89	0.0	0.4	0.4	24	7.2	7.2	7.3	24	125.0	135.7	148.4	24
12-JAN-89	0.0	0.4	0.4	24	7.2	7.2	7.3	24	132.8	137.0	140.6	24
13-JAN-89	0.0	0.4	0.4	24	7.2	7.2	7.3	24	132.8	145.5	195.3	24
14-JAN-89	0.0	0.4	0.4	24	7.2	7.3	7.3	24	136.7	142.6	148.4	24
15-JAN-89	0.0	0.4	0.4	18	7.2	7.3	7.4	18	136.7	141.9	156.2	18
16-JAN-89	0.0	0.4	0.4	24	7.2	7.3	7.3	24	136.7	142.9	148.4	24
17-JAN-89	0.0	0.4	0.4	24	7.1	7.2	7.4	24	89.8	118.8	148.4	24
18-JAN-89	0.0	0.4	0.4	12	7.1	7.1	7.1	12	85.9	88.2	93.7	12
19-JAN-89	0.0	0.0	0.0	0	****	****	****	**	*******	*******	*******	**
20-JAN-89	0.0	0.4	0.4	15	7.0	7.0	7.2	15	89.8	106.2	148.4	15
21-JAN-89	0.0	0.0	0.0	0	****	****	****	**	*******	*******	*******	**
22-JAN-89	0.0	0.1	0.4	18	7.0	7.1	7.2	18	89.8	95.9	101.6	18
23-JAN-89	0.0	0.4	0.4	18	7.0	7.0	7.1	18	89.8	92.0	93.7	18
24-JAN-89	0.0	0.4	0.4	21	6.9	7.0	7.1	21	85.9	101.0	128.9	21
25-JAN-89	0.0	0.5	0.8	24	7.1	7.2	7.3	24	125.0	139.0	148.4	24
26-JAN-89	0.0	0.2	0.4	24	7.2	7.3	7.4	24	128.9	149.1	164.0	24
27-JAN-89	0.0	0.3	0.4	21	7.1	7.1	7.2	21	105.5	117.4	136.7	21
28-JAN-89	0.0	0.4	0.4	24	7.1	7.1	7.2	24	93.7	103.7	125.0	24
29-JAN-89	0.0	0.5	0.8	24	7.1	7.1	7.1	24	89.8	95.0	132.8	24
30-JAN-89	0.0	0.6	0.8	24	7.1	7.1	7.1	24	89.8	95.0	121.1	24
31-JAN-89	0.8	0.9	1.6	15	7.1	7.1	7.2	15	89.8	96.3	113.3	15
GRAND MONTHLY MEAN	0.0	0.4	0.5		7.1	7.1	7.2		105.7	115.0	138.2	

0 A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMGN VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-JAN-89 to 31-JAN-89

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-JAN-89	13.1	13.2	13.3	12	93.7	94.6	95.4	12	*******	*******	*******	**
2-JAN-89	13.3	13.4	13.5	24	94.9	95.8	96.4	24	*******	*******	*******	**
3-JAN-89	13.2	13.3	13.5	18	94.2	95.0	96.4	18	*******	*******	*******	**
4-JAN-89	12.6	13.1	13.2	24	89.3	93.4	94.8	24	*******	*******	*******	**
5-JAN-89	12.5	12.8	13.0	24	88.8	90.9	93.1	24	*******	*******	*******	**
6-JAN-89	13.2	13.4	13.5	21	93.2	95.1	96.4	21	*******	*******	*******	**
7-JAN-89	13.1	13.2	13.4	24	92.6	94.7	95.9	24	*******	*******	*******	**
8-JAN-89	12.8	13.2	13.5	24	92.0	94.5	97.0	24	*******	*******	*******	**
9-JAN-89	12.5	12.6	12.8	18	89.8	90.4	91.4	18	*******	*******	*******	**
10-JAN-89	12.5	12.8	13.0	18	89.8	91.9	93.1	18	*******	*******	*******	**
11-JAN-89	12.9	13.0	13.0	24	92.6	92.9	93.1	24	*******	*******	*******	**
12-JAN-89	12.8	13.1	13.3	24	92.0	93.9	95.4	24	*******	*******	*******	**
13-JAN-89	12.5	13.0	13.3	24	89.8	93.2	95.4	24	*******	*******	*******	**
14-JAN-89	12.5	12.8	13.3	24	89.2	92.0	95.4	24	*******	*******	*******	**
15-JAN-89	12.9	13.1	13.3	18	92.6	93.9	95.4	18	*******	*******	*******	**
16-JAN-89	12.5	12.7	13.0	24	89.8	90.8	93.1	24	*******	*******	*******	**
17-JAN-89	12.6	12.9	13.2	24	90.3	92.3	94.2	24	*******	*******	*******	**
18-JAN-89	12.7	13.0	13.2	12	90.9	92.8	94.8	12	*******	*******	*******	**
19-JAN-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
20-JAN-89	13.1	13.2	13.2	15	93.7	94.2	94.8	15	*******	*******	*******	**
21-JAN-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
22-JAN-89	12.9	13.4	13.9	18	92.6	95.3	98.2	18	*******	*******	*******	**
23-JAN-89	13.0	13.1	13.2	18	93.1	94.1	94.8	18	*******	*******	*******	**
24-JAN-89	13.0	13.2	13.2	21	93.1	94.0	94.8	21	*******	*******	*******	**
25-JAN-89	13.0	13.1	13.2	24	93.1	93.8	94.7	24	*******	*******	*******	**
26-JAN-89	13.2	13.4	13.6	24	94.2	95.2	96.5	24	*******	*******	*******	**
27-JAN-89	12.8	13.0	13.2	21	91.4	92.6	94.2	21	*******	*******	*******	**
28-JAN-89	12.8	13.1	13.4	24	92.0	94.2	95.9	24	*******	*******	*******	**
29-JAN-89	13.2	13.3	13.4	24	94.8	95.5	96.4	24	*******	*******	*******	**
30-JAN-89	13.2	13.2	13.3	24	94.2	95.2	96.4	24	*******	*******	*******	**
31-JAN-89	12.9	13.1	13.2	15	93.6	94.7	96.1	15	*******	*******	*******	**
GRAND MONTHLY MEAN	12.9	13.1	13.3		92.1	93.7	95.2		0.0	0.0	0.0	

* A day with less than 24 values.
**** No data values for that day.
@ A value for dissolved oxygen is approaching the objective.
(5.0 mg/l or 60% saturation)
? Daily mean flow is below 750 cf/s.

Calibration Certification: Thomas Spranger Date: July 22/90

SUMMARY OF DAILY AMEM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-FEB-89 to 28-FEB-89

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-FEB-89	1.2	1.4	1.6	24	7.0	7.1	7.2	24	89.8	94.1	109.4	24
2-FEB-89	0.4	0.9	2.0	24	7.1	7.1	7.2	24	89.8	98.5	113.3	24
3-FEB-89	0.0	0.4	0.4	24	7.1	7.1	7.2	24	97.6	106.8	113.3	24
4-FEB-89	0.0	0.4	0.4	3	7.2	7.2	7.2	3	148.4	149.7	152.3	3
5-FEB-89	0.0	0.4	0.4	24	7.2	7.2	7.3	24	152.3	154.4	164.0	24
6-FEB-89	0.0	0.4	0.4	18	7.2	7.2	7.2	18	121.1	133.0	144.5	18
7-FEB-89	0.0	0.3	0.4	24	7.1	7.2	7.4	24	105.5	132.1	156.2	24
8-FEB-89	0.0	0.4	0.4	24	7.1	7.2	7.4	24	105.5	130.8	152.3	24
9-FEB-89	0.0	0.4	0.4	24	7.3	7.4	7.4	24	136.7	147.4	156.2	24
10-FEB-89	0.0	0.3	0.4	24	7.4	7.4	7.4	24	144.5	149.1	164.0	24
11-FEB-89	0.0	0.4	0.4	21	7.2	7.2	7.4	21	101.6	117.5	148.4	21
12-FEB-89	0.0	0.4	0.4	24	7.2	7.3	7.3	24	132.8	140.4	144.5	24
13-FEB-89	0.0	0.4	0.4	24	7.3	7.3	7.4	24	144.5	152.3	160.1	24
14-FEB-89	0.0	0.4	0.4	12	7.3	7.4	7.4	12	132.8	155.6	164.0	12
15-FEB-89	0.0	0.6	0.8	15	7.2	7.2	7.2	15	117.2	125.2	136.7	15
16-FEB-89	0.0	0.8	0.8	24	7.2	7.3	7.3	24	136.7	173.0	324.2	24
17-FEB-89	0.0	0.5	0.8	24	7.2	7.3	7.3	24	128.9	146.0	164.0	24
18-FEB-89	0.0	0.3	0.4	24	7.2	7.2	7.3	24	121.1	132.6	148.4	24
19-FEB-89	0.0	0.4	0.4	24	7.1	7.2	7.3	24	117.2	127.1	144.5	24
20-FEB-89	0.0	0.4	0.4	21	7.2	7.3	7.3	21	136.7	150.8	167.9	21
21-FEB-89	0.0	0.4	0.4	15	7.3	7.3	7.4	15	164.0	169.0	187.5	15
22-FEB-89	0.0	0.7	1.2	24	7.1	7.2	7.3	24	128.9	139.5	167.9	24
23-FEB-89	0.0	0.9	1.2	24	7.0	7.1	7.1	24	121.1	128.6	136.7	24
24-FEB-89	0.0	0.3	0.4	24	7.0	7.0	7.1	24	121.1	125.0	136.7	24
25-FEB-89	0.0	0.3	0.4	24	7.1	7.1	7.2	24	140.6	145.2	148.4	24
26-FEB-89	0.0	0.2	0.4	21	7.1	7.2	7.2	21	144.5	152.5	156.2	21
27-FEB-89	0.0	0.4	0.4	24	7.1	7.2	7.3	24	144.5	149.4	156.2	24
28-FEB-89	0.4	0.5	0.8	24	7.2	7.2	7.3	24	152.3	155.7	160.1	24
GRAND MONTHLY MEAN	0.1	0.5	0.6		7.2	7.2	7.3		127.8	138.6	156.4	

@ A day with less than 24 values.
**** No data values for that day.

SUMMARY OF DAILY AMGM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-FEB-89 to 28-FEB-89

08-Sep-89 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-FEB-89	12.9	13.0	13.1	24	94.6	95.5	96.7	24	******	******	******	**
2-FEB-89	12.8	12.9	13.2	24	92.0	94.1	97.2	24	******	******	******	**
3-FEB-89	12.5	12.8	13.1	24	88.8	91.9	93.7	24	******	******	******	**
4-FEB-89	12.7	12.8	12.8	3	90.9	91.3	91.4	3	******	******	******	**
5-FEB-89	12.8	13.0	13.2	24	92.0	92.9	94.2	24	******	******	******	**
6-FEB-89	12.8	12.8	12.9	18	91.0	91.8	92.6	18	******	******	******	**
7-FEB-89	12.6	12.7	12.8	24	90.3	90.6	92.0	24	******	******	******	**
8-FEB-89	12.6	12.7	12.9	24	90.3	91.0	92.6	24	943.6	1119.6	1653.3	8
9-FEB-89	12.5	12.7	12.9	24	89.9	91.0	92.6	24	1043.8	1099.2	1381.1	24
10-FEB-89	12.2	12.6	12.9	24	86.2	89.8	92.7	24	911.7	1504.6	2637.1	24
11-FEB-89	12.4	12.5	12.6	21	88.9	89.6	90.1	21	1117.3	1193.2	1509.8	18
12-FEB-89	12.4	12.6	12.7	24	89.1	90.0	90.7	24	928.5	981.9	1133.5	24
13-FEB-89	12.5	12.6	12.7	24	89.7	90.1	90.9	24	913.5	1018.8	2130.4	24
14-FEB-89	12.8	12.8	12.9	12	91.4	92.0	92.6	12	1625.0	1885.4	2253.0	13
15-FEB-89	12.6	12.7	12.9	15	90.6	91.8	92.7	15	1057.6	1072.5	1115.3	6
16-FEB-89	12.6	12.7	12.8	24	91.1	92.0	92.8	24	******	******	******	**
17-FEB-89	12.6	12.8	13.1	24	90.7	91.8	93.6	24	******	******	******	**
18-FEB-89	12.8	13.0	13.1	24	91.4	92.8	94.2	24	******	******	******	**
19-FEB-89	12.5	12.8	13.0	24	89.8	91.4	93.2	24	******	******	******	**
20-FEB-89	12.6	12.8	12.9	21	90.0	91.5	92.7	21	913.5	930.6	958.8	14
21-FEB-89	12.5	12.6	12.8	15	89.5	90.4	91.7	15	1322.8	1337.8	1348.6	4
22-FEB-89	11.9	12.3	12.8	24	86.6	88.6	91.8	24	1069.4	1263.7	1476.0	18
23-FEB-89	12.0	12.1	12.2	24	86.4	87.7	89.4	24	1190.6	1277.4	1407.3	24
24-FEB-89	12.1	12.3	12.5	24	87.0	88.2	89.9	24	951.2	1069.0	1234.1	24
25-FEB-89	12.3	12.4	12.5	24	87.4	89.0	89.9	24	889.3	967.3	1004.8	24
26-FEB-89	12.3	12.4	12.5	21	88.0	88.5	89.0	21	981.7	1077.9	1213.3	24
27-FEB-89	12.3	12.3	12.5	24	87.9	88.3	89.6	24	981.7	984.5	993.3	23
28-FEB-89	12.4	12.5	12.6	24	89.2	89.9	91.3	24	906.1	977.3	989.4	20
GRAND MONTHLY MEAN	12.5	12.7	12.8		89.7	90.8	92.2		1044.0	1162.4	1437.6	

\# A day with less than 24 values.

**** No data values for that day.

@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)

? Daily mean flow is below 750 cf/s.

Calibration Certification: Thomas Hopkins Date: Aug 21/89

SUMMARY OF DAILY MEAN VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-MAR-89 to 31-MAR-89

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-MAR-89	0.4	0.6	1.2	18	7.3	7.3	7.3	18	156.2	156.4	160.1	18
2-MAR-89	0.8	0.9	1.2	24	7.3	7.3	7.4	24	152.3	155.9	156.2	24
3-MAR-89	0.4	0.6	0.8	21	7.3	7.3	7.4	21	156.2	159.8	164.0	21
4-MAR-89	0.4	0.4	0.4	15	7.1	7.2	7.4	15	113.3	129.1	164.0	15
5-MAR-89	0.4	0.5	0.8	21	7.1	7.2	7.2	21	117.2	130.4	144.5	21
6-MAR-89	0.4	0.5	0.8	15	7.2	7.3	7.3	15	148.4	157.8	171.9	15
7-MAR-89	0.0	0.3	0.8	21	7.3	7.3	7.3	21	152.3	158.6	167.9	21
8-MAR-89	0.0	0.3	0.4	24	7.2	7.2	7.3	24	148.4	159.6	210.9	24
9-MAR-89	0.0	0.5	0.8	21	7.2	7.2	7.3	21	144.5	149.7	179.7	21
10-MAR-89	0.0	0.5	1.2	21	7.3	7.3	7.3	21	156.2	167.0	183.6	21
11-MAR-89	0.0	1.1	1.2	15	7.3	7.3	7.3	15	152.3	155.2	164.0	15
12-MAR-89	0.0	1.6	2.0	21	7.3	7.3	7.3	21	144.5	149.3	156.2	21
13-MAR-89	0.0	1.2	1.6	24	7.3	7.3	7.3	24	152.3	157.4	164.0	24
14-MAR-89	0.0	1.6	2.3	24	7.3	7.3	7.3	24	156.2	161.3	171.9	24
15-MAR-89	0.0	2.7	3.5	24	7.0	7.3	7.3	24	152.3	165.0	171.9	24
16-MAR-89	0.0	2.5	2.7	23	7.1	7.1	7.1	24	128.9	142.6	152.3	24
17-MAR-89	0.0	2.4	2.7	24	7.1	7.1	7.2	24	128.9	133.0	140.6	24
18-MAR-89	0.0	1.6	2.7	21	7.0	7.1	7.2	21	89.8	110.1	148.4	21
19-MAR-89	0.0	1.0	2.0	21	7.0	7.0	7.1	21	89.8	90.9	109.4	21
20-MAR-89	0.0	1.7	2.0	21	7.0	7.0	7.2	21	85.9	99.3	136.7	21
21-MAR-89	0.0	1.9	2.3	18	7.2	7.9	8.7	18	97.6	138.2	160.1	18
22-MAR-89	0.0	1.2	2.0	21	7.1	7.2	7.4	21	82.0	90.8	113.3	21
23-MAR-89	0.0	2.0	2.3	21	7.2	7.2	7.2	21	113.3	132.4	148.4	21
24-MAR-89	0.0	2.3	3.1	21	7.2	7.2	7.2	21	148.4	152.9	156.2	21
25-MAR-89	0.0	1.6	2.0	12	7.0	7.0	7.0	12	97.6	105.5	144.5	12
26-MAR-89	0.0	1.9	2.3	21	6.9	7.0	7.0	21	93.7	107.9	128.9	21
27-MAR-89	0.0	2.6	3.1	20	7.0	7.0	7.1	21	113.3	128.9	136.7	21
28-MAR-89	0.0	2.9	3.5	21	6.9	6.9	7.0	21	93.7	104.7	121.1	21
29-MAR-89	0.0	3.2	3.9	21	6.8	6.9	6.9	21	82.0	88.5	97.6	21
30-MAR-89	0.0	2.3	3.5	24	6.7	6.8	6.9	24	74.2	78.1	82.0	24
31-MAR-89	1.2	1.6	2.0	21	6.8	6.8	6.9	21	74.2	74.2	74.2	21
GRAND MONTHLY MEAN												
	0.1	1.5	2.0		7.1	7.2	7.3		122.4	132.0	147.8	

0 A day with less than 24 values.
**** No data values for that day.

SUMMARY OF DAILY AMON VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-MAR-89 to 31-MAR-89

08-Sep-89 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-MAR-89	12.5	12.7	12.8	18	89.8	91.3	92.5	18	958.8	967.1	976.0	8
2-MAR-89	12.8	12.9	13.0	24	92.6	93.5	95.3	24	945.5	959.6	981.7	18
3-MAR-89	13.0	13.2	13.4	21	94.4	95.2	96.2	21	943.6	966.7	1020.3	13
4-MAR-89	13.1	13.1	13.3	15	93.5	93.9	95.2	15	1205.0	1596.0	2354.6	20
5-MAR-89	12.9	13.1	13.2	21	93.1	94.1	94.7	21	1101.3	1157.3	1244.5	4
6-MAR-89	13.0	13.1	13.2	15	93.1	94.0	95.4	15	1000.9	1028.4	1059.5	7
7-MAR-89	12.4	12.9	13.4	21	87.9	92.2	96.1	21	943.6	963.6	1012.6	10
8-MAR-89	12.8	13.0	13.4	24	90.8	93.1	96.2	24	******	******	******	**
9-MAR-89	13.1	13.2	13.4	21	94.1	95.0	95.8	21	******	******	******	**
10-MAR-89	12.9	13.0	13.2	21	93.1	94.0	94.8	21	******	******	******	**
11-MAR-89	12.9	13.0	13.2	15	94.3	95.0	96.4	15	******	******	******	**
12-MAR-89	12.9	13.1	13.3	21	96.3	96.9	98.0	21	******	******	******	**
13-MAR-89	13.1	13.2	13.4	24	95.6	96.5	97.8	24	******	******	******	**
14-MAR-89	12.9	13.0	13.1	24	95.6	96.5	98.2	24	******	******	******	**
15-MAR-89	11.6	12.6	13.1	24	88.3	96.4	99.9	24	906.1	965.7	1099.3	14
16-MAR-89	11.9	12.0	12.2	24	90.0	91.2	93.6	24	1014.5	1062.5	1117.3	10
17-MAR-89	12.1	12.4	12.7	24	90.5	94.3	97.3	24	******	******	******	**
18-MAR-89	12.3	12.6	12.9	21	92.1	93.6	96.7	21	2339.0	2347.8	2354.6	6
19-MAR-89	12.8	12.9	13.0	21	92.8	93.9	96.5	21	******	******	******	**
20-MAR-89	12.6	12.8	12.9	21	92.9	95.1	96.7	21	1166.0	1185.6	1246.6	6
21-MAR-89	12.2	12.5	12.9	18	91.2	93.6	96.7	18	1081.3	1381.4	1774.3	24
22-MAR-89	12.7	12.9	13.0	21	93.1	94.6	96.9	21	861.8	876.8	1006.7	21
23-MAR-89	12.6	12.8	13.0	21	94.3	95.8	97.5	21	861.8	861.8	861.8	16
24-MAR-89	12.6	12.8	12.9	21	95.9	96.4	97.9	21	2507.8	2507.8	2507.8	2
25-MAR-89	12.6	12.7	12.9	12	93.3	94.3	95.1	12	1028.1	2095.7	2507.8	21
26-MAR-89	12.0	12.3	12.7	21	89.8	92.0	94.0	21	1012.6	1053.7	1159.9	16
27-MAR-89	12.0	12.2	12.4	21	91.9	93.4	95.9	21	1079.4	1402.4	2010.1	15
28-MAR-89	11.7	12.1	12.4	21	88.6	92.7	96.9	21	1359.4	1753.9	2121.8	24
29-MAR-89	12.0	12.2	12.3	21	91.5	94.3	96.9	21	2144.8	2336.3	2802.2	24
30-MAR-89	11.9	12.2	12.4	24	89.8	91.9	96.6	24	2788.2	3009.9	3156.2	10
31-MAR-89	12.1	12.2	12.2	21	89.5	90.4	91.5	21	******	******	******	**
GRAND MONTHLY MEAN	12.5	12.7	12.9		92.2	94.0	96.1		1297.6	1451.4	1636.9	

0 A day with less than 24 values.
**** No data values for that day.
@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)
? Daily mean flow is below 750 cf/s.

Calibration Certification: _____ Date: _____

SUMMARY OF DAILY AMOM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-APR-89 to 30-APR-89

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-APR-89	1.6	1.8	2.0	15	6.8	6.8	6.9	15	78.1	79.9	82.0	15
2-APR-89	1.2	2.0	3.5	24	6.8	6.8	6.9	24	78.1	79.1	85.9	24
3-APR-89	1.6	2.4	3.5	24	6.7	6.8	6.8	24	78.1	79.6	85.9	24
4-APR-89	2.0	2.3	2.7	24	6.7	6.7	6.8	24	74.2	76.2	78.1	24
5-APR-89	2.0	2.3	3.1	24	6.6	6.7	6.7	24	66.4	69.3	74.2	24
6-APR-89	2.3	2.6	3.1	24	6.5	6.6	6.6	24	66.4	66.4	66.4	24
7-APR-89	2.3	2.9	3.5	21	6.6	6.6	6.7	21	50.8	62.7	66.4	21
8-APR-89	1.2	1.7	2.3	15	6.6	6.6	6.6	15	43.0	44.8	46.9	15
9-APR-89	0.8	1.1	2.0	18	6.4	6.5	6.5	18	39.1	39.3	43.0	18
10-APR-89	1.2	2.2	3.5	15	6.4	6.4	6.4	15	43.0	43.7	46.9	15
11-APR-89	1.6	2.2	3.5	21	6.5	6.5	6.6	21	46.9	47.2	50.8	21
12-APR-89	2.0	3.1	3.9	12	6.5	6.6	6.7	12	54.7	54.7	54.7	12
13-APR-89	2.3	3.2	4.3	24	6.5	6.6	6.6	24	54.7	57.1	58.6	24
14-APR-89	2.7	3.5	4.3	21	6.6	6.6	6.6	21	58.6	62.3	62.5	21
15-APR-89	3.5	4.2	5.5	15	6.7	6.7	6.7	15	66.4	68.0	70.3	15
16-APR-89	3.9	4.2	5.1	24	6.7	6.7	6.7	24	66.4	69.8	70.3	24
17-APR-89	3.5	3.9	4.7	24	6.7	6.7	6.7	24	70.3	70.3	70.3	24
18-APR-89	3.9	4.1	4.7	21	6.7	6.7	6.8	21	70.3	70.3	70.3	21
19-APR-89	3.5	3.9	4.3	24	6.7	6.7	6.7	24	70.3	70.3	70.3	24
20-APR-89	3.1	4.3	5.9	24	6.7	6.7	6.8	24	70.3	70.3	70.3	24
21-APR-89	3.9	4.9	6.3	21	6.7	6.7	6.8	21	70.3	70.3	70.3	21
22-APR-89	4.3	4.6	4.7	12	6.7	6.7	6.7	12	70.3	70.3	70.3	12
23-APR-89	3.5	4.0	4.7	24	6.7	6.7	6.7	24	70.3	70.3	70.3	24
24-APR-89	3.5	4.5	5.9	24	6.5	6.6	6.9	24	70.3	70.3	70.3	24
25-APR-89	3.5	4.5	5.9	18	6.7	6.8	6.9	18	70.3	70.3	70.3	18
26-APR-89	3.9	5.1	6.6	15	6.6	6.7	6.9	15	70.3	70.3	70.3	15
27-APR-89	4.7	5.9	7.0	24	6.8	6.9	6.9	24	70.3	70.5	74.2	24
28-APR-89	5.5	6.0	7.0	21	6.8	6.9	6.9	21	70.3	70.3	70.3	21
29-APR-89	5.5	6.8	9.0	24	6.6	6.8	6.9	24	70.3	72.7	74.2	24
30-APR-89	7.0	7.5	9.0	24	6.7	6.8	7.0	24	74.2	76.6	78.1	24
GRAND MONTHLY MEAN	3.0	3.7	4.7		6.6	6.7	6.7		65.1	66.4	68.1	

\$ A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMQM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-APR-89 to 30-APR-89

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-APR-89	12.1	12.2	12.3	15	89.5	91.1	92.3	15	******	******	******	**
2-APR-89	12.0	12.2	12.3	24	88.1	91.6	96.4	24	******	******	******	**
3-APR-89	12.0	12.1	12.3	24	89.2	91.9	95.2	24	******	******	******	**
4-APR-89	11.8	12.1	12.3	24	88.5	91.6	93.4	24	3126.0	3156.8	3236.5	8
5-APR-89	12.0	12.2	12.5	24	89.8	91.8	96.4	24	3298.5	3449.7	3533.8	16
6-APR-89	12.0	12.1	12.4	24	90.9	92.5	95.8	24	******	******	******	**
7-APR-89	12.0	12.2	12.8	21	91.0	93.9	100.0	21	******	******	******	**
8-APR-89	10.0	12.9	13.3	15	73.6	95.4	98.1	15	******	******	******	**
9-APR-89	13.3	13.5	13.6	18	96.4	98.4	101.9	18	******	******	******	**
10-APR-89	13.0	13.3	13.5	15	98.2	100.0	102.3	15	******	******	******	**
11-APR-89	10.0	13.0	13.3	21	74.7	98.0	101.2	21	******	******	******	**
12-APR-89	12.9	13.0	13.1	12	97.6	100.1	102.3	12	4138.1	4664.4	4931.5	14
13-APR-89	12.6	12.7	12.8	24	96.3	98.7	102.2	24	4062.0	4096.8	4129.1	24
14-APR-89	12.5	12.6	12.7	21	96.4	98.6	101.1	21	3800.7	4018.3	4106.7	16
15-APR-89	12.2	12.4	12.5	15	95.5	98.3	101.5	15	3337.6	3346.0	3357.3	17
16-APR-89	12.1	12.2	12.3	24	96.0	97.4	100.3	24	3232.6	3245.9	3337.6	16
17-APR-89	12.1	12.3	12.4	24	94.5	96.6	99.5	24	3310.2	3325.9	3341.6	10
18-APR-89	12.1	12.3	12.4	21	95.6	97.2	100.1	21	3186.6	3272.6	3310.2	20
19-APR-89	11.8	12.1	12.3	24	93.6	95.3	97.0	24	3232.6	3241.5	3248.0	20
20-APR-89	11.0	11.5	11.9	24	85.2	91.6	95.6	24	3224.9	3235.7	3248.0	21
21-APR-89	11.1	11.3	11.5	21	88.7	91.7	95.4	21	3217.2	3222.0	3232.6	17
22-APR-89	11.3	11.3	11.5	12	90.7	91.3	92.1	12	3217.2	3223.3	3232.6	14
23-APR-89	11.3	11.5	11.7	24	88.3	91.2	93.9	24	3186.6	3196.4	3217.2	23
24-APR-89	11.5	11.7	11.9	24	90.7	93.6	96.9	24	3190.4	3203.3	3217.2	19
25-APR-89	11.4	11.7	11.9	18	91.3	93.5	95.6	18	3047.5	3076.0	3217.2	7
26-APR-89	11.6	11.8	11.9	15	92.8	96.2	100.1	15	2981.3	3011.2	3084.7	8
27-APR-89	11.4	11.6	11.8	24	93.2	96.7	101.0	24	3110.9	3110.9	3110.9	5
28-APR-89	11.4	11.5	11.7	21	94.0	96.3	99.2	21	3107.2	3110.4	3110.9	8
29-APR-89	11.3	11.5	12.1	24	93.4	98.4	107.7	24	2616.9	2679.5	2753.4	18
30-APR-89	11.3	11.6	11.9	24	97.2	100.4	106.8	24	2537.2	2551.4	2560.3	17
GRAND MONTHLY MEAN	11.8	12.1	12.4		91.4	95.3	98.7		3245.8	3306.6	3358.0	

\# A day with less than 24 values.

**** No data values for that day.

@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)

? Daily mean flow is below 750 cf/s.

Calibration Certification: Thomas A Sowers Date: Aug 22/89

SUMMARY OF DAILY ANOM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-MAY-89 to 31-MAY-89

26-Sep-89 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-MAY-89	9.8	9.8	9.8	3	7.0	7.0	7.0	3	78.1	78.1	78.1	3
2-MAY-89	7.8	8.3	9.8	24	6.9	6.9	7.0	24	74.2	74.5	78.1	24
3-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
4-MAY-89	8.2	9.4	10.6	15	6.6	6.6	6.7	15	58.6	58.6	58.6	15
5-MAY-89	9.4	10.1	11.7	21	6.5	6.7	6.9	21	58.6	58.6	58.6	21
6-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
7-MAY-89	10.2	10.9	11.3	9	6.6	6.6	6.6	9	54.7	54.7	54.7	9
8-MAY-89	10.2	10.8	11.7	24	6.5	6.6	6.6	24	50.8	52.7	54.7	24
9-MAY-89	10.6	11.0	11.7	24	6.5	6.5	6.5	24	50.8	50.8	50.8	24
10-MAY-89	10.6	11.1	11.7	24	6.4	6.5	6.5	24	50.8	50.8	50.8	24
11-MAY-89	10.9	11.5	11.7	24	6.4	6.4	6.5	24	50.8	51.1	54.7	24
12-MAY-89	11.3	11.5	12.1	24	6.4	6.4	6.5	24	46.9	49.8	50.8	24
13-MAY-89	11.7	11.8	12.1	24	6.4	6.4	6.4	24	43.0	46.7	46.9	24
14-MAY-89	11.7	11.7	12.1	22	6.2	6.3	6.4	22	39.1	42.8	43.0	22
15-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
16-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
17-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
18-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
19-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
20-MAY-89	****	****	****	**	****	****	****	**	******	******	******	**
21-MAY-89	16.4	17.0	17.6	14	6.3	6.4	6.4	14	43.0	43.0	43.0	14
22-MAY-89	16.4	17.2	18.0	24	6.3	6.4	6.5	24	46.9	50.0	50.8	24
23-MAY-89	16.4	17.2	18.7	24	6.4	6.4	6.5	24	50.8	54.5	54.7	24
24-MAY-89	16.8	17.4	18.4	23	6.3	6.5	6.6	23	54.7	62.5	66.5	23
25-MAY-89	16.8	17.0	17.6	21	6.6	6.6	6.6	21	66.5	69.9	74.5	21
26-MAY-89	16.8	17.5	18.7	21	6.6	6.6	6.7	21	66.8	74.2	78.5	21
27-MAY-89	17.2	18.0	19.5	15	6.6	6.6	6.7	15	70.9	71.9	74.9	15
28-MAY-89	17.2	17.9	19.5	21	6.6	6.6	6.7	21	71.0	71.3	74.9	21
29-MAY-89	16.4	17.3	18.7	18	6.5	6.6	6.8	18	67.5	71.1	71.4	18
30-MAY-89	17.2	17.8	18.7	24	6.7	6.7	6.8	24	67.5	71.3	71.6	24
31-MAY-89	16.8	17.6	18.7	24	6.6	6.7	6.7	24	67.7	70.9	71.8	24
GRAND MONTHLY MEAN	13.3	13.9	14.8		6.5	6.6	6.6		57.8	60.0	61.4	

0 A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AWQM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-MAY-89 to 31-MAY-89

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-MAY-89	11.1	11.2	11.2	3	102.1	102.6	102.9	3	3051.2	3114.0	3137.3	5
2-MAY-89	10.2	10.5	11.1	24	89.1	92.7	102.1	24	3156.2	3179.5	3232.6	9
3-MAY-89	****	****	****	**	*****	*****	*****	**	3599.3	3703.3	4593.4	15
4-MAY-89	10.2	10.5	10.9	15	90.0	95.5	102.0	15	******	******	******	**
5-MAY-89	10.0	10.4	10.8	21	91.3	96.8	104.2	21	2736.0	2770.8	2791.7	7
6-MAY-89	****	****	****	**	*****	*****	*****	**	******	******	******	**
7-MAY-89	10.2	10.3	10.4	9	94.5	97.2	99.6	9	6716.3	6768.4	6813.0	11
8-MAY-89	9.8	10.1	10.3	24	90.9	95.5	99.7	24	6668.2	7236.4	8783.1	24
9-MAY-89	9.8	10.1	10.3	24	91.8	95.1	99.0	24	6590.6	7196.6	7571.3	24
10-MAY-89	9.8	10.0	10.2	24	91.0	94.5	97.4	24	6407.6	6504.3	6578.7	24
11-MAY-89	9.8	10.0	10.1	24	93.4	95.4	97.4	24	6360.9	6568.8	7753.6	21
12-MAY-89	10.0	10.1	10.3	24	95.1	97.2	99.9	24	8160.0	8965.4	10374.0	24
13-MAY-89	9.8	10.0	10.3	24	93.7	96.3	99.0	24	9673.9	10340.1	12671.0	24
14-MAY-89	8.5	9.1	10.0	22	81.7	87.4	96.8	22	12801.0	14488.9	16706.0	24
15-MAY-89	****	****	****	**	*****	*****	*****	**	16706.0	17224.8	17852.0	24
16-MAY-89	****	****	****	**	*****	*****	*****	**	17523.0	17872.6	18000.0	21
17-MAY-89	****	****	****	**	*****	*****	*****	**	15679.0	16744.8	17475.0	18
18-MAY-89	****	****	****	**	*****	*****	*****	**	14030.0	14964.0	15712.0	24
19-MAY-89	****	****	****	**	*****	*****	*****	**	11518.0	13041.8	14030.0	24
20-MAY-89	****	****	****	**	*****	*****	*****	**	10262.0	11341.6	11920.0	24
21-MAY-89	7.9	8.0	8.1	14	84.6	87.3	89.4	14	5326.1	8510.5	10168.0	24
22-MAY-89	7.7	7.9	8.3	24	83.6	86.6	91.9	24	5221.8	5526.2	5782.9	21
23-MAY-89	7.9	8.1	8.3	24	86.3	88.5	91.9	24	3737.0	5081.2	5410.3	24
24-MAY-89	7.7	8.0	8.6	23	83.5	87.3	93.7	23	3066.1	3431.9	3644.9	24
25-MAY-89	7.7	7.9	8.2	21	83.4	86.3	90.0	21	2430.4	2795.3	3051.2	24
26-MAY-89	7.8	8.0	8.3	21	84.1	88.5	93.9	21	2919.6	3098.6	3126.0	10
27-MAY-89	7.8	7.9	8.1	15	84.6	88.1	93.5	15	3110.9	3110.9	3110.9	2
28-MAY-89	7.2	7.7	8.0	21	78.4	85.4	91.7	21	3110.9	3110.9	3110.9	4
29-MAY-89	7.8	8.2	8.4	18	85.1	89.6	94.1	18	3110.9	3116.2	3126.0	5
30-MAY-89	7.6	7.9	8.3	24	83.8	87.7	94.1	24	3073.5	3095.9	3110.9	24
31-MAY-89	7.5	7.8	8.2	24	82.0	85.9	92.7	24	2992.2	3016.2	3084.7	24
GRAND MONTHLY MEAN	8.9	9.1	9.4		88.0	91.6	96.4		6887.5	7445.5	8024.9	

\# A day with less than 24 values.

**** No data values for that day.

@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)

? Daily mean flow is below 750 cf/s.

Calibration Certification: Thom A Spicer Date: Aug 22/89

SUMMARY OF DAILY ANQM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-JUN-89 to 30-JUN-89

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-JUN-89	17.6	18.1	18.7	24	6.6	6.7	6.8	24	67.9	68.2	71.8	24
2-JUN-89	17.6	18.4	19.5	24	6.7	6.7	6.8	24	68.1	68.2	68.3	24
3-JUN-89	18.4	19.3	20.7	24	6.6	6.7	6.7	24	68.3	69.9	72.4	24
4-JUN-89	18.4	19.1	20.7	24	6.7	6.7	6.7	24	72.4	75.1	76.5	24
5-JUN-89	18.0	18.8	20.7	24	6.5	6.6	6.7	24	76.6	78.1	84.6	24
6-JUN-89	18.7	19.6	20.7	24	6.7	6.8	6.9	24	80.7	82.9	88.7	24
7-JUN-89	18.4	18.6	19.5	24	6.7	6.7	6.8	24	92.6	111.4	116.2	24
8-JUN-89	18.4	18.9	19.5	24	6.6	6.7	6.8	24	85.1	96.0	116.2	24
9-JUN-89	18.0	18.8	19.9	24	6.5	6.6	6.7	24	81.5	90.5	104.7	24
10-JUN-89	17.2	18.2	19.9	24	6.4	6.5	6.6	24	73.7	75.1	81.5	24
11-JUN-89	16.8	17.1	18.0	24	6.5	6.5	6.5	24	62.3	71.9	77.8	24
12-JUN-89	16.4	17.1	18.0	24	6.4	6.5	6.5	24	58.5	60.8	62.6	24
13-JUN-89	16.4	17.0	18.0	24	6.5	6.5	6.6	24	62.6	62.7	62.8	24
14-JUN-89	16.4	17.2	18.4	24	6.5	6.5	6.6	24	59.1	62.7	63.0	24
15-JUN-89	16.8	17.5	18.4	24	6.5	6.5	6.6	24	63.0	68.1	71.0	24
16-JUN-89	16.4	17.0	18.4	24	6.5	6.6	6.6	24	71.0	71.1	71.2	24
17-JUN-89	16.4	16.7	17.2	24	6.5	6.5	6.6	24	71.2	71.3	71.4	24
18-JUN-89	16.4	16.8	17.2	24	6.5	6.5	6.6	24	71.4	71.5	71.6	24
19-JUN-89	16.8	17.7	19.5	24	6.5	6.5	6.6	24	71.6	75.0	75.7	24
20-JUN-89	18.0	19.1	20.7	24	6.5	6.6	6.6	24	75.7	75.8	75.9	24
21-JUN-89	18.7	20.0	21.9	24	6.6	6.6	6.7	24	72.0	72.5	76.0	24
22-JUN-89	19.9	21.2	22.3	23	6.7	6.7	6.7	23	72.3	74.8	76.3	23
23-JUN-89	20.7	21.5	22.3	23	6.6	6.6	6.7	24	74.2	77.4	78.1	23
24-JUN-89	20.3	21.4	22.3	24	6.6	6.6	6.7	24	78.1	78.1	78.1	24
25-JUN-89	21.1	21.8	22.6	24	6.6	6.6	6.7	24	82.0	86.2	89.8	24
26-JUN-89	21.1	22.1	23.8	24	6.6	6.6	6.7	24	85.9	85.9	85.9	24
27-JUN-89	22.3	23.3	24.6	24	6.5	6.6	6.6	24	82.0	88.0	93.7	24
28-JUN-89	23.0	23.8	25.0	24	6.6	6.6	6.6	24	89.8	93.6	101.6	24
29-JUN-89	22.3	22.9	23.8	21	6.5	6.6	6.6	21	82.0	85.4	93.7	21
30-JUN-89	22.3	23.2	24.2	24	6.5	6.6	6.7	24	85.9	88.7	93.7	24
GRAND MONTHLY MEAN	18.6	19.4	20.5		6.6	6.6	6.7		74.6	77.9	81.7	

\# A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMQM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-JUN-89 to 30-JUN-89

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-JUN-89	7.5	7.9	8.3	24	82.4	87.5	93.4	24	3006.9	3021.5	3043.8	24
2-JUN-89	7.8	8.0	8.3	24	85.7	89.9	94.2	24	3036.4	3037.6	3051.2	24
3-JUN-89	7.4	7.7	8.1	24	82.6	88.6	95.1	24	2613.6	2721.9	3051.2	24
4-JUN-89	7.1	7.5	8.0	24	79.7	85.2	94.1	24	2613.6	2620.2	2640.5	24
5-JUN-89	7.4	7.7	7.8	24	83.0	87.0	91.9	24	2093.4	2290.0	2627.0	24
6-JUN-89	6.9	7.2	7.9	24	78.8	83.5	92.7	24	1028.1	1380.3	2165.2	24
7-JUN-89	7.1	7.6	7.8	24	79.8	85.2	88.2	24	1180.3	1640.9	2121.8	24
8-JUN-89	7.3	7.6	8.0	24	82.9	86.5	90.0	24	1205.0	1802.3	2168.1	24
9-JUN-89	7.6	7.9	7.9	24	86.5	88.9	91.3	24	2160.1	2578.5	3148.6	24
10-JUN-89	7.4	7.9	8.5	24	83.4	88.5	93.2	24	2694.8	2957.2	3156.2	24
11-JUN-89	8.1	8.4	8.7	24	88.1	91.0	95.6	24	3156.2	4089.7	5320.8	24
12-JUN-89	8.7	8.8	9.1	24	93.8	96.2	100.5	24	4371.4	4825.8	5154.7	24
13-JUN-89	8.7	9.1	9.6	24	92.7	99.3	105.4	24	4408.7	4517.1	4636.7	21
14-JUN-89	8.9	9.3	9.6	24	95.1	101.8	107.1	24	3194.3	4394.0	4699.6	18
15-JUN-89	8.6	9.0	9.5	24	93.1	99.2	106.1	24	3126.0	3156.9	3186.6	24
16-JUN-89	8.9	9.0	9.2	24	96.2	98.1	103.3	24	3129.7	3155.4	3171.4	18
17-JUN-89	8.8	8.9	9.1	24	94.4	96.4	99.4	24	3156.2	3157.6	3171.4	24
18-JUN-89	8.8	8.9	9.1	24	94.2	96.4	99.4	24	2722.3	3054.5	3156.2	24
19-JUN-89	8.7	8.8	9.0	24	93.9	97.3	103.2	24	2722.3	2757.5	2830.4	24
20-JUN-89	8.5	8.8	9.0	24	94.5	99.7	106.6	24	2833.9	2957.3	3062.3	24
21-JUN-89	8.3	8.6	9.0	24	94.9	99.5	105.6	24	2826.8	2997.4	3051.2	24
22-JUN-89	8.0	8.2	8.4	23	92.6	97.6	101.4	23	2694.8	2735.5	2812.7	24
23-JUN-89	7.6	7.7	7.9	23	89.3	92.1	96.1	23	2566.9	2665.6	2694.8	21
24-JUN-89	7.3	7.5	7.7	24	84.8	90.1	93.2	24	1880.4	2369.5	2657.4	24
25-JUN-89	7.3	7.5	7.7	24	87.2	90.4	93.2	24	2159.4	2240.5	2256.0	24
26-JUN-89	7.0	7.3	7.5	24	85.4	88.1	91.4	24	2231.8	2242.2	2243.9	21
27-JUN-89	6.0	6.7	7.0	24	76.2	83.0	88.5	24	1585.3	1821.0	2240.9	22
28-JUN-89	5.8	6.2	6.4	24	72.1	78.5	82.6	24	2065.3	2250.5	2600.2	23
29-JUN-89	6.4	6.6	6.9	21	79.4	81.6	86.4	21	2168.1	2280.2	2600.2	24
30-JUN-89	6.5	6.8	7.0	24	79.6	84.3	88.5	24	1099.3	1463.8	2168.1	24
GRAND MONTHLY MEAN	7.7	8.0	8.3		86.7	91.0	95.9		2524.6	2772.7	3029.6	

\# A day with less than 24 values.

**** No data values for that day.

∂ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)

? Daily mean flow is below 750 cf/s.

Calibration Certification: [signature] Date: Aug 22/90

SUMMARY OF DAILY ANOM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-JUL-89 to 31-JUL-89

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-JUL-89	22.6	23.1	23.4	24	6.6	6.7	6.7	24	97.6	116.0	125.0	24
2-JUL-89	21.9	22.6	23.0	18	6.6	6.6	6.7	18	97.6	110.4	125.0	18
3-JUL-89	21.9	22.2	22.6	24	6.6	6.7	6.7	24	97.6	103.3	109.4	24
4-JUL-89	21.1	21.6	22.6	24	6.6	6.6	6.7	24	89.8	91.8	97.6	24
5-JUL-89	20.7	21.3	21.9	24	6.5	6.6	6.6	24	89.8	89.8	89.8	24
6-JUL-89	21.1	21.8	22.6	24	6.6	6.6	6.6	24	85.9	95.8	105.5	24
7-JUL-89	21.9	22.6	23.4	24	6.7	6.7	6.7	24	85.9	93.6	101.6	24
8-JUL-89	21.9	23.1	23.8	24	6.7	6.7	6.7	24	85.9	93.4	101.6	24
9-JUL-89	22.3	23.0	23.8	24	6.7	6.7	6.7	24	85.9	90.2	93.7	24
10-JUL-89	21.5	22.8	24.2	24	6.7	6.7	6.7	24	93.7	96.5	101.6	24
11-JUL-89	20.7	21.2	21.5	24	6.6	6.7	6.8	24	89.8	98.5	101.6	24
12-JUL-89	19.9	21.1	22.6	24	6.7	6.7	6.8	24	89.8	89.8	89.8	24
13-JUL-89	21.1	22.1	23.0	24	6.7	6.7	6.8	24	85.9	87.7	93.7	24
14-JUL-89	21.9	22.6	23.4	22	6.7	6.7	6.8	22	85.9	92.7	101.6	22
15-JUL-89	21.5	22.4	23.8	24	6.7	6.8	6.8	24	85.9	89.3	93.7	24
16-JUL-89	21.9	22.8	23.8	24	6.7	6.8	6.9	24	82.0	86.1	89.8	24
17-JUL-89	21.5	22.2	23.4	24	6.7	6.8	6.9	24	89.8	90.8	93.7	24
18-JUL-89	20.7	21.7	23.0	24	6.7	6.8	7.0	24	89.8	95.2	97.6	24
19-JUL-89	21.5	22.7	23.8	24	6.8	6.9	7.0	24	93.7	101.4	113.3	24
20-JUL-89	21.9	22.6	23.4	24	6.8	6.8	6.9	24	89.8	97.0	101.6	24
21-JUL-89	22.3	23.1	24.2	24	6.7	6.8	6.9	24	89.8	93.9	97.6	24
22-JUL-89	22.3	23.6	24.6	24	6.8	6.8	6.9	24	78.1	85.9	89.8	24
23-JUL-89	23.4	24.4	25.0	24	6.8	6.8	6.8	24	82.0	86.7	93.7	24
24-JUL-89	23.4	24.3	25.0	24	6.7	6.8	6.8	24	82.0	89.2	93.7	24
25-JUL-89	23.4	24.3	25.4	24	6.7	6.7	6.8	24	78.1	85.4	93.7	24
26-JUL-89	23.8	25.0	26.2	24	6.6	6.7	6.7	24	78.1	82.8	85.9	24
27-JUL-89	24.6	25.6	26.2	24	6.7	6.7	6.7	24	82.0	84.5	89.8	24
28-JUL-89	24.6	25.4	26.6	24	6.7	6.8	7.0	24	89.8	101.7	109.4	24
29-JUL-89	23.4	24.0	24.6	24	6.9	7.0	7.0	24	97.6	105.5	117.2	24
30-JUL-89	23.0	23.6	24.2	24	7.0	7.0	7.0	24	117.2	119.4	121.1	24
31-JUL-89	22.6	23.7	25.0	24	6.6	6.8	7.0	24	43.0	78.6	125.0	24
GRAND MONTHLY MEAN	22.1	23.0	23.9		6.7	6.7	6.8		87.4	94.3	101.4	

\# A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMGM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-JUL-89 to 31-JUL-89

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-JUL-89	6.4	6.6	7.0	24	79.4	82.3	86.8	24	1075.4	1354.0	2026.5	24
2-JUL-89	6.6	6.8	7.2	18	79.3	83.2	88.3	18	1400.7	1734.5	2076.5	24
3-JUL-89	6.9	7.1	7.3	24	83.0	86.1	90.1	24	1409.5	1869.7	2076.5	24
4-JUL-89	7.0	7.2	7.5	24	84.2	86.9	92.1	24	2062.5	2073.2	2076.5	24
5-JUL-89	7.1	7.3	7.5	24	83.8	87.3	89.9	24	1067.5	1792.6	2068.1	24
6-JUL-89	7.1	7.3	7.5	24	84.5	88.1	91.4	24	1223.7	1819.7	2791.7	24
7-JUL-89	7.0	7.2	7.4	24	84.9	88.7	92.6	24	1161.9	1784.2	2032.0	24
8-JUL-89	6.9	7.1	7.4	24	84.0	88.5	93.4	24	1776.8	2015.4	2032.0	24
9-JUL-89	7.0	7.2	7.5	24	84.7	88.9	94.4	24	1617.9	1757.7	2032.0	24
10-JUL-89	6.9	7.1	7.3	24	84.4	87.2	93.1	24	1617.9	1628.7	1665.1	24
11-JUL-89	7.0	7.3	7.7	24	82.8	86.5	91.7	24	1648.5	1955.2	2043.1	24
12-JUL-89	7.4	7.6	7.8	24	86.0	90.5	95.9	24	1722.8	1933.6	2021.1	24
13-JUL-89	7.3	7.5	7.8	24	86.3	90.7	95.9	24	1449.2	1818.5	2079.3	24
14-JUL-89	7.1	7.3	7.8	22	85.9	89.3	95.9	22	1539.3	1984.9	2159.4	24
15-JUL-89	7.2	7.4	7.7	24	86.2	90.5	95.7	24	2076.5	2391.7	2627.0	24
16-JUL-89	7.1	7.3	7.6	24	85.9	90.1	95.4	24	1977.7	2007.3	2277.3	24
17-JUL-89	7.0	7.2	7.6	24	83.3	87.6	94.6	24	1564.5	1928.7	2079.3	24
18-JUL-89	7.0	7.1	7.3	24	82.6	85.8	90.9	24	1182.4	1540.7	1799.2	24
19-JUL-89	6.9	7.1	7.4	24	83.3	87.3	93.4	24	1460.4	1858.0	2065.3	24
20-JUL-89	6.9	7.1	7.3	24	83.0	86.8	90.9	24	1400.7	1826.4	2107.5	24
21-JUL-89	6.9	7.1	7.5	24	83.7	88.3	95.1	24	1836.9	1905.0	1945.7	24
22-JUL-89	6.8	7.1	7.4	24	83.5	89.2	94.9	24	1811.7	1863.5	1882.9	24
23-JUL-89	6.7	7.0	7.3	24	84.6	89.6	94.6	24	1608.6	1759.6	1811.7	24
24-JUL-89	6.6	6.9	7.3	24	81.9	87.7	93.6	24	1791.7	1972.7	2560.3	24
25-JUL-89	6.5	6.8	7.2	24	80.9	86.4	92.7	24	1771.8	2191.4	2573.6	24
26-JUL-89	6.3	6.7	7.1	24	80.3	86.3	92.4	24	1814.2	2313.7	2573.6	24
27-JUL-89	6.3	6.4	6.9	24	79.9	84.0	90.7	24	1240.3	1638.1	2197.6	24
28-JUL-89	5.9	6.1	6.4	24	76.0	79.7	85.3	24	1478.2	1858.3	2228.8	24
29-JUL-89	6.0	6.2	6.5	24	75.0	78.3	82.2	24	1435.9	1480.8	1553.0	24
30-JUL-89	6.1	6.3	6.6	24	76.0	79.2	83.2	24	1435.9	1772.9	2600.2	24
31-JUL-89	5.6	6.3	7.2	24	69.6	79.5	92.7	24	2576.9	2596.3	2620.3	24
GRAND MONTHLY MEAN	6.8	7.0	7.3		82.2	86.5	91.9		1588.3	1884.7	2151.1	

8 A day with less than 24 values.

No data values for that day.

a A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)

? Daily mean flow is below 750 cf/s.

Calibration Certification: Thomas A Sullivan Date: Aug 2-/90

SUMMARY OF DAILY AKRM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-AUG-89 to 31-AUG-89

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-AUG-89	22.6	23.6	25.0	24	6.5	6.7	6.9	24	39.1	42.5	43.0	24
2-AUG-89	21.9	22.8	23.8	24	6.3	6.5	6.7	24	39.1	42.6	46.9	24
3-AUG-89	21.5	22.3	23.0	21	6.6	6.7	6.8	21	50.8	74.0	85.9	21
4-AUG-89	21.5	21.6	21.9	18	6.8	6.8	6.9	18	101.6	113.9	117.2	18
5-AUG-89	21.1	21.3	21.5	24	6.8	6.8	6.9	24	113.3	114.6	117.2	24
6-AUG-89	21.1	21.4	21.5	6	6.9	6.9	6.9	6	113.3	116.5	117.2	6
7-AUG-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
8-AUG-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
9-AUG-89	20.7	21.7	22.6	9	6.6	6.8	6.9	9	97.6	100.7	101.6	9
10-AUG-89	20.7	21.8	23.0	24	6.5	6.7	6.9	24	85.9	90.8	97.6	24
11-AUG-89	21.1	22.1	23.0	24	6.5	6.7	6.9	24	85.9	88.0	89.8	24
12-AUG-89	21.1	21.8	23.0	24	6.5	6.6	6.8	24	85.9	88.5	93.7	24
13-AUG-89	21.5	21.9	23.0	24	6.6	6.6	6.7	24	85.9	86.7	93.7	24
14-AUG-89	21.9	22.5	23.0	24	6.6	6.7	6.8	24	78.1	81.5	85.9	24
15-AUG-89	23.0	23.3	23.8	24	6.6	6.8	6.9	24	82.0	109.4	125.0	24
16-AUG-89	23.4	23.7	23.8	11	6.8	6.8	6.9	11	125.0	134.2	136.7	11
17-AUG-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
18-AUG-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
19-AUG-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
20-AUG-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
21-AUG-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
22-AUG-89	23.0	23.4	23.8	9	6.9	7.0	7.0	9	140.6	141.0	144.5	9
23-AUG-89	22.3	22.6	23.0	24	6.8	6.9	6.9	24	136.7	140.4	140.6	24
24-AUG-89	21.1	21.8	22.3	24	6.7	6.8	6.9	24	105.5	123.7	144.5	24
25-AUG-89	19.9	20.8	22.3	24	6.7	6.8	6.9	24	101.6	102.4	105.5	24
26-AUG-89	18.7	19.6	20.3	24	6.7	6.8	7.0	24	97.6	101.4	105.5	24
27-AUG-89	18.4	19.4	20.3	23	6.6	6.8	7.0	23	82.0	86.9	97.6	23
28-AUG-89	18.4	19.5	20.3	24	6.6	6.8	7.0	24	82.0	82.2	85.9	24
29-AUG-89	18.7	19.7	20.7	24	6.7	6.8	7.0	24	78.1	81.4	82.0	24
30-AUG-89	18.7	19.4	20.7	24	6.8	6.9	7.0	24	78.1	79.3	82.0	24
31-AUG-89	18.4	19.0	19.5	18	6.7	6.7	6.9	18	78.1	78.5	82.0	18
GRAND MONTHLY MEAN												
	20.9	21.5	22.3		6.7	6.8	6.9		90.2	95.9	100.9	

\# A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMON VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-AUG-89 to 31-AUG-89

07-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-AUG-89	6.4	6.8	7.2	24	80.1	85.1	92.7	24	2101.9	2462.6	2613.6	24
2-AUG-89	5.9	6.2	6.7	24	71.2	76.1	83.7	24	1601.6	1961.4	2298.8	24
3-AUG-89	5.9	6.1	6.7	21	70.2	74.8	82.9	21	1394.2	2030.8	2600.2	22
4-AUG-89	5.9	6.0	6.1	18	70.6	72.2	73.6	18	1617.9	1625.5	1636.7	14
5-AUG-89	6.1	6.2	6.3	24	73.2	74.3	75.7	24	1617.9	1643.5	1689.0	24
6-AUG-89	6.1	6.1	6.2	6	72.7	73.3	74.1	6	1636.7	1763.6	1929.9	7
7-AUG-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
8-AUG-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
9-AUG-89	6.3	6.5	6.8	9	73.7	78.2	83.6	9	2159.4	2448.0	2694.8	11
10-AUG-89	6.2	6.6	6.9	24	73.2	79.3	84.8	24	2698.2	2707.5	2708.5	24
11-AUG-89	6.1	6.4	6.8	24	72.3	78.2	84.0	24	2694.8	2703.4	2708.5	24
12-AUG-89	6.2	6.4	6.6	24	74.4	77.1	81.5	24	2179.9	2570.1	2805.7	24
13-AUG-89	6.2	6.4	6.6	24	74.9	77.6	81.4	24	2805.7	2818.2	2848.1	24
14-AUG-89	6.1	6.3	6.6	24	74.1	77.3	81.5	24	1067.5	1866.2	2819.8	24
15-AUG-89	5.9	6.1	6.3	24	73.6	76.2	78.2	24	1043.8	1062.4	1083.3	24
16-AUG-89	5.8	6.0	6.2	11	72.8	74.7	77.9	11	1036.0	1037.5	1043.8	8
17-AUG-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
18-AUG-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
19-AUG-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
20-AUG-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
21-AUG-89	****	****	****	**	*****	*****	*****	**	*******	*******	*******	**
22-AUG-89	6.0	6.1	6.3	9	74.4	76.4	79.0	9	1004.8	1011.3	1012.6	9
23-AUG-89	6.0	6.2	6.4	24	73.3	76.2	78.8	24	1004.8	1132.3	1703.5	24
24-AUG-89	6.2	6.4	6.9	24	74.4	76.9	83.8	24	1703.5	1707.6	1713.1	24
25-AUG-89	6.8	7.1	7.6	24	80.9	84.2	88.7	24	1703.5	1707.4	1713.1	24
26-AUG-89	7.4	7.5	7.7	24	84.0	86.7	88.9	24	1693.8	2023.6	2640.5	24
27-AUG-89	7.4	7.6	7.8	23	84.8	87.3	91.5	23	2219.8	2508.8	2667.5	24
28-AUG-89	7.4	7.6	7.8	24	85.2	87.8	91.6	24	2654.0	2663.4	2667.5	24
29-AUG-89	7.1	7.4	7.8	24	82.7	86.0	89.9	24	2667.5	2672.2	2781.2	24
30-AUG-89	7.2	7.3	7.5	24	81.6	83.5	88.7	24	2667.5	2677.4	2736.0	21
31-AUG-89	7.2	7.4	7.6	17	81.6	84.4	87.5	18	2654.0	2691.3	2729.1	24
GRAND MONTHLY MEAN	6.4	6.6	6.9		76.2	79.3	83.5		1901.2	2062.3	2243.5	

@ A day with less than 24 values.
**** No data values for that day.
@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)
? Daily mean flow is below 750 cf/s.

Calibration Certification Thomas A Jenkins Date: Aug 22/89

SUMMARY OF DAILY AMGM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-SEP-89 to 30-SEP-89

07-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-SEP-89	18.0	18.4	19.5	24	6.7	6.7	6.9	24	78.1	78.3	82.0	24
2-SEP-89	18.0	18.7	19.9	24	6.8	6.9	6.9	24	78.1	78.1	78.1	24
3-SEP-89	18.0	18.8	19.9	24	6.7	6.8	6.9	24	78.1	78.1	78.1	24
4-SEP-89	17.2	18.4	19.5	24	6.7	6.8	7.0	24	78.1	78.1	78.1	24
5-SEP-89	17.6	18.5	19.5	24	6.7	6.9	7.0	24	78.1	80.2	82.0	24
6-SEP-89	17.2	18.3	19.1	24	6.7	6.9	7.1	24	78.1	81.5	82.0	24
7-SEP-89	17.6	18.6	19.9	24	6.7	6.9	7.1	24	46.9	66.9	85.9	24
8-SEP-89	18.0	19.1	20.3	24	6.8	7.0	7.1	24	82.0	85.4	85.9	24
9-SEP-89	18.4	19.4	20.3	24	6.7	6.9	7.1	24	85.9	85.9	85.9	24
10-SEP-89	19.1	20.2	21.5	23	6.7	6.9	7.1	23	85.9	87.8	89.8	23
11-SEP-89	19.9	20.8	21.5	24	6.7	6.9	7.1	24	82.0	86.6	89.8	24
12-SEP-89	20.3	21.0	21.5	24	6.6	6.8	7.0	24	62.5	67.5	78.1	24
13-SEP-89	19.9	20.6	21.1	24	6.7	6.8	6.9	24	78.1	87.6	89.8	24
14-SEP-89	19.5	20.2	21.1	24	6.6	6.7	6.9	24	89.8	90.0	93.7	24
15-SEP-89	18.4	18.9	19.5	24	6.6	6.6	6.7	24	74.2	83.8	89.8	24
16-SEP-89	18.0	18.7	19.9	24	6.7	6.8	7.0	24	85.9	99.6	105.5	24
17-SEP-89	18.4	19.0	19.9	24	6.8	6.9	7.0	24	93.7	101.5	105.5	24
18-SEP-89	17.6	18.1	19.1	24	6.7	6.7	6.9	24	93.7	95.4	101.6	24
19-SEP-89	18.0	18.5	19.1	24	6.7	6.7	6.8	24	54.7	81.4	97.6	24
20-SEP-89	18.0	18.1	18.4	24	6.7	6.8	6.8	24	43.0	48.7	54.7	24
21-SEP-89	18.0	18.4	19.1	24	6.7	6.7	6.8	24	43.0	43.0	43.0	24
22-SEP-89	18.4	19.0	19.1	24	6.7	6.7	6.8	24	39.1	42.6	43.0	24
23-SEP-89	18.4	19.0	19.5	21	6.7	6.8	6.8	21	43.0	43.0	43.0	21
24-SEP-89	16.8	16.9	17.2	9	6.6	6.6	6.7	9	39.1	41.2	43.0	9
25-SEP-89	15.6	16.4	17.2	24	6.6	6.7	6.9	24	43.0	48.8	54.7	24
26-SEP-89	16.0	16.4	17.2	24	6.8	6.9	6.9	24	50.8	52.4	54.7	24
27-SEP-89	14.5	15.1	16.0	24	6.8	6.9	7.0	24	54.7	64.0	70.3	24
28-SEP-89	13.3	14.1	14.8	24	6.9	7.0	7.2	24	70.3	85.1	89.8	24
29-SEP-89	13.3	14.1	14.8	24	7.1	7.2	7.2	24	74.2	80.1	85.9	24
30-SEP-89	12.9	13.8	14.8	24	6.8	6.9	7.2	24	54.7	62.7	74.2	24
GRAND MONTHLY MEAN	17.5	18.2	19.0		6.7	6.8	7.0		68.0	73.5	77.8	

9 A day with less than 24 values.
**** No data values for that day.

SUMMARY OF DAILY AMOM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-SEP-89 to 30-SEP-89

07-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-SEP-89	7.5	7.7	7.8	24	84.3	86.1	87.5	24	2694.8	2707.8	2708.5	24
2-SEP-89	7.3	7.7	7.9	24	82.5	87.0	88.4	24	2440.0	2684.9	2736.0	24
3-SEP-89	7.4	7.6	7.9	24	82.0	86.6	89.7	24	2537.2	2659.3	2667.5	24
4-SEP-89	7.6	7.9	8.1	24	86.2	88.3	92.3	24	2667.5	2674.1	2681.2	24
5-SEP-89	7.7	7.9	8.0	24	87.2	88.5	90.7	24	2681.2	2681.2	2681.2	24
6-SEP-89	7.6	7.9	8.0	24	85.6	88.0	90.6	24	2616.9	2663.0	2681.2	24
7-SEP-89	7.6	7.8	8.0	24	84.0	87.6	91.5	24	2630.4	2667.4	2681.2	24
8-SEP-89	7.3	7.5	7.6	24	82.8	85.3	88.5	24	2667.5	2670.1	2681.2	24
9-SEP-89	7.2	7.5	7.8	24	81.1	85.4	90.4	24	2667.5	2667.5	2667.5	24
10-SEP-89	6.9	7.3	7.7	23	78.4	85.3	92.6	23	2298.8	2572.3	2667.5	24
11-SEP-89	7.0	7.3	7.7	24	82.2	86.8	92.6	24	2613.6	2622.0	2627.0	24
12-SEP-89	7.0	7.2	7.7	24	81.3	86.1	91.8	24	2623.6	2628.1	2640.5	24
13-SEP-89	6.6	7.0	7.5	24	77.1	82.7	89.2	24	2640.5	2647.5	2654.0	24
14-SEP-89	6.6	6.9	7.4	24	76.2	80.0	87.4	24	2654.0	2666.4	2667.5	24
15-SEP-89	6.7	7.1	7.4	24	76.8	80.5	83.1	24	2007.4	2439.5	2729.1	24
16-SEP-89	7.1	7.2	7.4	24	79.9	81.6	84.0	24	1757.0	2136.2	2225.8	24
17-SEP-89	6.8	7.0	7.2	24	76.4	79.7	83.6	24	1806.7	2546.3	2681.2	24
18-SEP-89	7.1	7.2	7.4	24	78.4	80.2	83.2	24	1335.7	1698.0	2182.8	24
19-SEP-89	7.3	7.3	7.5	24	81.1	82.4	84.0	24	1123.4	1167.5	1324.9	24
20-SEP-89	7.4	7.5	7.7	24	81.9	84.2	86.2	24	928.5	1119.2	1174.2	24
21-SEP-89	7.4	7.5	7.8	24	81.9	84.1	87.8	24	913.5	1179.0	1407.3	24
22-SEP-89	7.3	7.6	7.8	24	82.0	86.3	88.6	24	955.0	995.2	1188.5	24
23-SEP-89	7.4	7.6	7.8	21	82.7	86.2	89.4	21	1067.5	1136.5	1259.2	24
24-SEP-89	7.9	8.2	8.4	9	85.8	88.9	91.0	9	1259.2	1767.9	1831.8	9
25-SEP-89	8.1	8.3	8.5	24	85.4	89.0	91.9	24	1831.8	2270.3	2417.6	24
26-SEP-89	8.0	8.2	8.4	24	85.3	87.6	91.9	24	2392.3	2636.8	2812.7	24
27-SEP-89	8.1	8.5	9.0	24	85.4	88.1	92.8	24	2770.7	2842.8	2941.2	24
28-SEP-89	8.7	8.9	9.1	24	87.9	90.3	93.6	24	2805.7	2824.5	2869.4	24
29-SEP-89	8.8	8.9	9.1	24	88.8	90.9	93.6	24	2777.7	2796.1	2805.7	24
30-SEP-89	8.8	9.1	9.5	24	89.5	92.2	96.1	24	2736.0	2745.3	2798.7	24
GRAND MONTHLY MEAN	7.5	7.7	8.0		82.7	85.9	89.5		2163.4	2317.1	2403.1	

@ A day with less than 24 values.
**** No data values for that day.
@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)
? Daily mean flow is below 750 cf/s.

Calibration Certification Thomas A Spiers Date: Aug 22/90

SUMMARY OF DAILY AKON VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-OCT-89 to 31-OCT-89

07-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-OCT-89	12.5	13.2	14.1	24	6.9	7.0	7.2	24	62.5	69.5	74.2	24
2-OCT-89	12.5	13.4	14.5	24	7.1	7.2	7.3	24	74.2	76.0	78.1	23
3-OCT-89	13.7	14.1	14.5	24	7.2	7.2	7.3	24	78.1	80.9	82.0	24
4-OCT-89	12.1	12.8	14.5	24	7.0	7.1	7.2	24	78.1	80.6	82.0	24
5-OCT-89	11.3	11.7	12.5	21	7.0	7.0	7.1	21	78.1	79.8	82.0	21
6-OCT-89	10.9	11.3	11.3	24	7.0	7.0	7.2	24	78.1	78.1	78.1	24
7-OCT-89	11.3	11.4	11.7	24	7.1	7.2	7.2	24	74.2	77.9	78.1	24
8-OCT-89	10.6	11.0	11.7	24	7.0	7.1	7.2	24	74.2	77.3	78.1	24
9-OCT-89	10.2	10.6	11.3	24	7.0	7.0	7.2	24	74.2	75.7	78.1	24
10-OCT-89	9.0	9.8	10.6	24	6.9	7.1	9.2	24	58.6	63.3	74.2	24
11-OCT-89	9.4	9.6	10.2	24	6.9	6.9	7.0	24	58.6	64.0	70.3	24
12-OCT-89	9.0	9.5	10.6	24	6.8	6.9	7.1	24	70.3	76.8	78.1	24
13-OCT-89	9.4	10.1	10.6	24	7.0	7.0	7.1	24	74.2	77.5	78.1	24
14-OCT-89	9.4	9.9	10.6	24	6.7	6.9	7.1	24	70.3	70.6	74.2	24
15-OCT-89	9.0	9.7	10.2	21	6.7	6.8	7.1	21	70.3	79.8	89.8	21
16-OCT-89	10.2	10.3	10.6	24	7.0	7.0	7.1	24	89.8	91.0	93.7	24
17-OCT-89	9.8	10.3	10.6	24	6.9	7.0	7.1	24	93.7	99.3	101.6	24
18-OCT-89	8.6	9.0	9.8	24	6.9	6.9	6.9	24	89.8	94.9	101.6	24
19-OCT-89	8.2	8.6	9.0	24	6.9	6.9	7.1	24	82.0	86.7	89.8	24
20-OCT-89	8.6	8.7	9.0	24	7.0	7.1	7.1	24	89.8	94.5	109.4	24
21-OCT-89	9.0	10.0	10.9	24	7.1	7.2	7.2	24	101.6	107.6	113.3	24
22-OCT-89	8.6	9.2	10.6	24	6.8	6.9	7.1	24	101.6	102.2	105.5	24
23-OCT-89	8.2	8.7	9.4	21	6.9	6.9	7.1	21	97.6	98.9	101.6	21
24-OCT-89	8.6	9.1	9.8	24	6.9	7.0	7.1	24	93.7	99.3	101.6	24
25-OCT-89	8.6	9.4	9.8	24	6.9	7.0	7.1	24	89.8	92.3	97.6	24
26-OCT-89	9.4	9.8	10.2	24	6.9	7.0	7.1	24	93.7	95.8	97.6	24
27-OCT-89	9.4	9.8	10.2	24	6.9	7.0	7.1	24	93.7	96.5	97.6	24
28-OCT-89	10.2	10.5	11.3	24	7.0	7.0	7.1	24	93.7	106.3	121.1	24
29-OCT-89	10.6	10.9	11.7	18	7.0	7.0	7.1	18	121.1	129.5	132.8	18
30-OCT-89	10.9	11.1	11.3	12	7.0	7.0	7.1	12	136.7	139.6	144.5	12
31-OCT-89	10.6	10.7	10.9	24	6.9	7.0	7.1	24	105.5	118.8	144.5	24
GRAND MONTHLY MEAN												
	10.0	10.5	11.1		6.9	7.0	7.2		85.4	89.7	94.5	

\# A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMGM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-OCT-89 to 31-OCT-89

07-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-OCT-89	9.2	9.4	9.5	24	90.2	93.1	96.1	24	2736.0	2746.7	2749.9	24
2-OCT-89	9.1	9.3	9.5	24	91.1	93.5	95.9	23	2749.9	2756.3	2798.7	24
3-OCT-89	8.9	9.0	9.2	24	89.7	91.7	94.6	24	2583.5	2750.9	2802.2	24
4-OCT-89	9.0	9.3	9.6	24	88.9	91.5	94.2	24	2590.2	2758.1	2805.7	24
5-OCT-89	9.4	9.5	9.8	21	89.4	91.3	94.2	21	2777.7	2777.7	2777.7	24
6-OCT-89	9.6	9.7	9.8	24	90.7	92.0	93.1	24	2767.3	2777.8	2795.2	24
7-OCT-89	9.6	9.7	9.8	24	91.6	92.3	94.1	24	2777.7	2779.4	2791.7	24
8-OCT-89	9.7	9.9	10.1	24	90.7	93.1	96.2	24	2777.7	2781.1	2791.7	24
9-OCT-89	10.0	10.1	10.4	24	91.9	94.5	97.3	24	2749.9	2773.6	2777.7	24
10-OCT-89	10.0	10.3	10.4	24	91.5	95.2	97.3	24	2749.9	2749.9	2749.9	24
11-OCT-89	10.2	10.2	10.3	24	92.7	93.8	96.0	24	2749.9	2775.7	2833.9	24
12-OCT-89	10.1	10.2	10.3	24	91.0	93.0	96.2	24	2791.7	2797.4	2833.9	24
13-OCT-89	10.0	10.1	10.3	24	91.3	93.9	96.2	24	2777.7	2786.3	2791.7	24
14-OCT-89	10.0	10.2	10.3	24	91.9	93.6	95.4	24	1779.3	2524.8	2791.7	24
15-OCT-89	10.0	10.1	10.3	21	91.0	93.0	95.2	21	1776.8	1816.5	1872.6	24
16-OCT-89	9.9	10.0	10.2	24	91.6	92.9	95.4	24	1862.4	1866.8	1872.6	24
17-OCT-89	9.8	9.9	10.1	24	90.9	91.9	92.8	24	1862.4	1924.4	2311.1	24
18-OCT-89	10.1	10.3	10.5	24	90.9	92.5	94.6	24	2076.5	2300.8	2694.8	22
19-OCT-89	10.5	10.5	10.6	24	92.8	93.8	95.3	24	1924.6	2248.5	2777.7	8
20-OCT-89	10.3	10.4	10.7	24	92.3	93.6	96.0	24	1342.1	1517.5	1882.9	24
21-OCT-89	9.9	10.1	10.3	24	92.4	93.2	94.7	24	1608.6	1807.1	1988.5	24
22-OCT-89	10.0	10.1	10.4	24	89.5	92.0	94.7	24	1622.6	1825.8	1922.0	24
23-OCT-89	10.4	10.5	10.6	21	92.1	94.0	96.2	21	1455.9	1826.0	1882.9	24
24-OCT-89	10.5	10.6	10.7	24	93.7	95.2	97.1	24	1735.0	1950.7	2144.8	24
25-OCT-89	10.3	10.4	10.6	24	93.0	95.1	97.1	24	1801.7	1960.4	2133.3	24
26-OCT-89	10.2	10.3	10.4	24	92.7	94.7	96.7	24	1781.7	1791.9	1801.7	24
27-OCT-89	10.0	10.2	10.4	24	92.2	94.1	96.7	24	981.7	1461.4	1781.7	24
28-OCT-89	9.5	9.9	10.1	24	89.0	92.5	93.7	24	921.0	933.6	970.2	24
29-OCT-89	9.5	9.6	9.7	18	88.9	90.6	91.4	18	921.0	923.6	936.0	19
30-OCT-89	9.4	9.5	9.7	12	88.3	89.8	91.3	12	921.0	1386.6	1589.9	14
31-OCT-89	9.6	9.7	9.8	24	89.6	90.5	91.9	24	1280.3	1373.8	1589.9	24
GRAND MONTHLY MEAN	9.8	10.0	10.1		91.1	93.0	95.1		2039.8	2175.8	2298.2	

0 A day with less than 24 values.
**** No data values for that day.
@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)
? Daily mean flow is below 750 cf/s.

Calibration Certification Thomas A Springer Date: Aug 22 1990

SUMMARY OF DAILY AMON VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-NOV-89 to 30-NOV-89

09-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-NOV-89	10.9	11.2	11.7	10	7.0	7.1	7.1	10	109.4	111.7	113.3	10
2-NOV-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
3-NOV-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
4-NOV-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
5-NOV-89	****	****	****	**	****	****	****	**	*******	*******	*******	**
6-NOV-89	7.0	7.4	7.4	7	6.6	6.6	6.6	7	121.1	124.4	125.0	7
7-NOV-89	7.4	8.2	8.6	24	6.6	6.6	6.7	24	121.1	129.2	136.7	24
8-NOV-89	7.8	8.3	8.6	24	6.6	6.6	6.6	24	125.0	126.3	128.9	24
9-NOV-89	7.8	8.2	9.0	24	6.6	6.6	6.7	24	113.3	122.5	132.8	24
10-NOV-89	9.4	9.4	9.8	24	6.5	6.6	6.7	24	85.9	98.8	125.0	24
11-NOV-89	8.2	8.6	9.0	21	6.4	6.4	6.6	21	85.9	92.4	105.5	21
12-NOV-89	7.4	8.1	8.6	21	6.5	6.6	6.6	21	89.8	96.9	109.4	21
13-NOV-89	5.5	6.2	7.4	21	6.5	6.5	6.7	21	78.1	80.3	85.9	21
14-NOV-89	5.5	5.9	6.3	24	6.6	6.7	6.7	24	78.1	83.6	93.7	24
15-NOV-89	6.3	6.4	7.0	24	6.7	6.7	6.8	24	89.8	93.6	97.6	24
16-NOV-89	7.0	8.0	9.0	24	6.7	6.7	6.8	24	82.0	88.9	97.6	24
17-NOV-89	8.2	8.9	9.4	24	6.5	6.7	6.8	24	78.1	85.1	97.6	24
18-NOV-89	7.0	7.2	7.8	24	6.6	6.7	6.8	24	78.1	78.4	82.0	24
19-NOV-89	5.9	6.5	7.0	24	6.7	6.7	6.8	24	78.1	78.1	78.1	24
20-NOV-89	4.7	5.1	5.9	24	6.7	6.7	6.8	24	74.2	76.2	78.1	24
21-NOV-89	4.7	4.9	5.1	9	6.7	6.7	6.7	9	74.2	74.2	74.2	9
22-NOV-89	1.6	1.6	1.6	3	6.7	6.7	6.7	3	70.3	72.9	74.2	3
23-NOV-89	1.2	1.2	1.6	24	6.7	6.8	6.8	24	74.2	84.8	93.7	24
24-NOV-89	0.4	0.7	1.2	24	6.7	6.8	6.8	24	85.9	85.9	85.9	24
25-NOV-89	0.4	0.7	1.2	24	6.7	6.8	6.8	24	85.9	85.9	85.9	24
26-NOV-89	1.2	1.2	1.2	24	6.8	6.9	6.9	24	85.9	89.0	89.8	24
27-NOV-89	0.8	1.1	1.2	24	6.8	6.9	6.9	24	89.8	91.1	93.7	24
28-NOV-89	0.4	0.6	0.8	24	6.8	6.8	6.9	24	89.8	93.4	101.6	24
29-NOV-89	0.4	0.8	1.2	24	6.9	6.9	6.9	24	93.7	97.2	101.6	24
30-NOV-89	0.4	0.4	0.4	24	6.7	6.8	6.8	24	93.7	96.8	105.5	24
GRAND MONTHLY MEAN	4.9	5.3	5.7		6.7	6.7	6.8		89.7	93.8	99.7	

\# A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMQM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-NOV-89 to 30-NOV-89

09-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-NOV-89	9.7	9.7	9.8	10	91.3	92.2	93.0	10	1203.0	1440.8	1882.9	24
2-NOV-89	****	****	****	**	*****	*****	*****	**	1340.0	1369.9	1523.4	24
3-NOV-89	****	****	****	**	*****	*****	*****	**	1340.0	1340.0	1340.0	24
4-NOV-89	****	****	****	**	*****	*****	*****	**	1340.0	1340.0	1340.0	24
5-NOV-89	****	****	****	**	*****	*****	*****	**	1340.0	1340.0	1340.0	24
6-NOV-89	10.6	10.7	10.7	7	90.6	91.8	92.2	7	922.9	1252.2	1340.0	24
7-NOV-89	10.2	10.5	10.7	24	90.9	92.4	93.9	24	1022.3	1214.7	1331.4	24
8-NOV-89	10.3	10.4	10.4	24	89.9	91.8	93.1	24	1131.5	1270.5	1400.7	24
9-NOV-89	10.2	10.4	10.4	24	89.9	91.5	93.4	24	1012.6	1609.7	2774.2	24
10-NOV-89	9.9	10.0	10.2	24	89.3	90.9	92.8	24	1365.9	2274.3	2833.9	24
11-NOV-89	9.9	10.1	10.2	21	87.5	89.6	92.0	21	1276.0	1652.3	2037.5	24
12-NOV-89	10.2	10.4	10.8	20	90.0	91.6	94.2	21	2168.1	2438.6	2812.7	18
13-NOV-89	10.8	11.0	11.2	21	90.5	92.7	94.4	21	2292.6	2545.8	2809.2	24
14-NOV-89	11.0	11.2	11.2	24	91.5	92.9	94.4	24	1727.7	1937.5	2231.8	18
15-NOV-89	10.9	11.0	11.1	24	91.9	92.9	95.1	24	1801.7	2182.1	2749.9	24
16-NOV-89	10.7	10.9	11.0	24	93.4	95.6	99.3	24	1762.0	2099.6	2705.1	18
17-NOV-89	10.6	10.8	10.9	24	94.9	96.8	98.9	24	2718.8	2974.1	3186.6	24
18-NOV-89	10.6	10.8	10.9	24	90.6	93.0	95.1	24	2603.5	2807.4	2876.5	24
19-NOV-89	10.7	10.9	11.3	24	90.7	92.4	93.7	24	2777.7	2789.7	2795.2	19
20-NOV-89	11.3	11.4	11.4	24	91.5	92.3	93.7	24	2749.9	2882.4	3006.9	15
21-NOV-89	11.2	11.3	11.3	9	90.3	91.3	91.9	9	*******	*******	*******	**
22-NOV-89	12.9	12.9	13.0	3	95.1	95.7	96.3	3	*******	*******	*******	**
23-NOV-89	12.9	13.1	13.2	24	94.7	96.0	97.0	24	*******	*******	*******	**
24-NOV-89	13.2	13.3	13.4	24	94.4	96.2	97.6	24	*******	*******	*******	**
25-NOV-89	13.3	13.4	13.4	24	95.5	96.8	97.7	24	*******	*******	*******	**
26-NOV-89	12.7	12.9	13.4	24	93.1	94.2	98.2	24	*******	*******	*******	**
27-NOV-89	12.6	12.7	12.9	24	92.0	93.0	94.3	24	*******	*******	*******	**
28-NOV-89	12.7	12.9	13.0	24	91.2	92.7	94.5	24	*******	*******	*******	**
29-NOV-89	12.6	12.9	13.2	24	91.1	93.1	94.6	24	*******	*******	*******	**
30-NOV-89	13.1	13.2	13.4	24	93.5	94.7	96.3	24	*******	*******	*******	**
GRAND MONTHLY MEAN	11.3	11.5	11.6		91.7	93.2	94.9		1694.8	1938.1	2215.9	

\# A day with less than 24 values.

**** No data values for that day.

@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)

? Daily mean flow is below 750 cf/s.

Calibration Certification Thomas A Sweeney Date: Aug 22/90

SUMMARY OF DAILY AMOM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-DEC-89 to 31-DEC-89

07-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	TEMPERATURE C				pH units				SPECIFIC CONDUCTANCE us/cm			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-DEC-89	0.4	0.4	0.4	24	6.7	6.8	6.8	24	101.6	105.6	109.4	24
2-DEC-89	0.4	0.4	0.4	24	6.8	6.8	6.8	24	105.5	112.9	117.2	24
3-DEC-89	0.4	0.4	0.4	24	6.8	6.8	6.8	24	105.5	113.1	121.1	24
4-DEC-89	0.4	0.4	0.4	24	6.7	6.8	6.9	24	105.5	118.6	132.8	24
5-DEC-89	0.4	0.4	0.4	24	6.8	6.8	6.9	24	121.1	127.9	136.7	24
6-DEC-89	0.4	0.4	0.4	24	6.8	6.8	6.8	24	132.8	134.3	136.7	24
7-DEC-89	0.4	0.4	0.4	24	6.6	6.8	6.9	24	70.3	110.7	136.7	23
8-DEC-89	0.4	0.4	0.4	24	6.5	6.6	6.7	24	62.5	70.8	82.0	24
9-DEC-89	0.4	0.4	0.4	24	6.6	6.7	6.9	24	82.0	102.2	136.7	24
10-DEC-89	0.4	0.4	0.4	24	6.8	6.8	6.9	24	109.4	117.7	128.9	24
11-DEC-89	0.4	0.4	0.4	24	6.9	6.9	7.0	24	121.1	125.3	128.9	24
12-DEC-89	0.4	0.4	0.4	24	6.5	6.8	7.0	24	113.3	121.4	128.9	24
13-DEC-89	0.4	0.4	0.4	24	6.4	6.5	6.5	24	101.6	111.1	132.8	24
14-DEC-89	0.4	0.4	0.4	24	6.5	6.6	6.6	24	132.8	138.0	140.6	24
15-DEC-89	0.4	0.4	0.4	24	6.4	6.5	6.6	24	109.4	122.5	140.6	24
16-DEC-89	0.4	0.4	0.4	24	6.5	6.5	6.6	24	136.7	140.6	148.4	24
17-DEC-89	0.4	0.4	0.4	24	6.5	6.6	6.7	24	113.3	125.3	148.4	24
18-DEC-89	0.4	0.4	0.4	24	6.5	6.5	6.6	24	109.4	119.9	136.7	24
19-DEC-89	0.4	0.4	0.4	24	6.5	6.6	6.7	24	132.8	138.5	152.3	24
20-DEC-89	0.4	0.4	0.4	24	6.3	6.5	6.6	24	97.6	112.1	136.7	24
21-DEC-89	0.4	0.4	0.4	24	6.5	6.7	7.0	24	109.4	128.1	148.4	24
22-DEC-89	0.4	0.4	0.4	24	6.9	7.0	7.1	24	105.5	112.3	121.1	24
23-DEC-89	0.4	0.4	0.4	24	6.9	6.9	7.1	24	101.6	112.6	136.7	24
24-DEC-89	0.4	0.4	0.4	24	6.9	7.0	7.1	24	113.3	124.3	140.6	24
25-DEC-89	0.4	0.4	0.4	24	7.1	7.2	7.2	24	121.1	132.3	140.6	24
26-DEC-89	0.4	0.4	0.4	24	7.2	7.2	7.3	24	117.2	125.3	140.6	24
27-DEC-89	0.4	0.4	0.4	24	7.1	7.2	7.3	24	117.2	132.8	144.5	24
28-DEC-89	0.4	0.4	0.4	24	7.1	7.1	7.3	24	136.7	142.2	152.3	24
29-DEC-89	0.4	0.4	0.4	24	7.1	7.2	7.3	24	148.4	152.8	156.2	24
30-DEC-89	0.0	0.4	0.4	23	7.0	7.1	7.3	23	152.3	155.4	160.1	23
31-DEC-89	0.4	0.4	0.4	24	7.3	7.4	7.5	24	156.2	158.8	160.1	23
GRAND MONTHLY MEAN	0.4	0.4	0.4		6.7	6.8	6.9		114.3	124.0	136.6	

@ A day with less than 24 values.

**** No data values for that day.

SUMMARY OF DAILY AMOM VALUES FOR THE ST. CROIX RIVER AT MILLTOWN

Period from 01-DEC-89 to 31-DEC-89

07-Feb-90 ENVIRONMENT CANADA WATER QUALITY BRANCH - MONCTON

DAY	DISSOLVED OXYGEN mg/l				DISSOLVED OXYGEN % saturation				FLOW cf/s			
	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS	MIN.	MEAN	MAX.	HRS
1-DEC-89	13.1	13.2	13.4	24	93.6	94.5	95.8	24	*******	*******	*******	**
2-DEC-89	13.5	13.5	13.6	24	96.4	96.9	97.5	24	*******	*******	*******	**
3-DEC-89	13.0	13.3	13.5	24	93.1	95.3	97.0	24	*******	*******	*******	**
4-DEC-89	12.2	12.4	13.0	24	87.6	89.0	93.1	24	*******	*******	*******	**
5-DEC-89	12.6	12.8	13.1	24	90.4	91.6	93.8	24	*******	*******	*******	**
6-DEC-89	12.9	13.0	13.1	24	92.6	93.0	93.8	24	*******	*******	*******	**
7-DEC-89	12.2	12.4	12.9	23	87.7	88.6	91.0	23	*******	*******	*******	**
8-DEC-89	12.4	13.0	13.4	24	88.8	92.9	96.1	24	*******	*******	*******	**
9-DEC-89	13.1	13.2	13.3	24	93.9	94.4	95.0	24	*******	*******	*******	**
10-DEC-89	13.0	13.2	13.3	24	93.4	94.2	95.0	24	*******	*******	*******	**
11-DEC-89	12.6	13.0	13.2	24	90.6	93.4	94.5	24	*******	*******	*******	**
12-DEC-89	12.6	12.7	13.0	24	90.6	91.4	92.9	24	*******	*******	*******	**
13-DEC-89	12.7	12.8	12.8	24	90.9	91.2	92.0	24	*******	*******	*******	**
14-DEC-89	12.7	12.8	12.9	24	90.9	91.5	92.6	24	*******	*******	*******	**
15-DEC-89	12.5	12.7	12.8	24	89.8	90.7	92.0	24	*******	*******	*******	**
16-DEC-89	12.5	12.7	12.8	24	89.2	90.9	91.4	24	*******	*******	*******	**
17-DEC-89	11.9	12.1	12.3	24	85.3	86.6	88.1	24	*******	*******	*******	**
18-DEC-89	11.7	11.9	12.0	24	83.7	85.0	85.9	24	*******	*******	*******	**
19-DEC-89	11.8	12.0	12.2	24	84.7	86.1	87.5	24	*******	*******	*******	**
20-DEC-89	11.8	11.9	12.1	24	84.7	85.5	86.4	24	*******	*******	*******	**
21-DEC-89	12.1	12.4	12.5	24	86.4	88.4	89.8	24	*******	*******	*******	**
22-DEC-89	12.3	12.5	12.6	24	88.1	89.3	90.3	24	*******	*******	*******	**
23-DEC-89	12.4	12.5	12.6	24	88.7	89.4	90.3	24	*******	*******	*******	**
24-DEC-89	12.4	12.5	12.7	24	88.7	89.8	90.9	24	*******	*******	*******	**
25-DEC-89	12.4	12.5	12.5	24	88.7	89.1	89.8	24	*******	*******	*******	**
26-DEC-89	11.1	11.7	12.4	24	79.7	83.5	88.7	24	*******	*******	*******	**
27-DEC-89	11.1	11.2	11.6	24	79.7	80.6	83.1	24	*******	*******	*******	**
28-DEC-89	11.7	12.0	12.2	24	83.7	86.3	87.5	24	*******	*******	*******	**
29-DEC-89	12.1	12.1	12.2	24	87.0	87.2	87.5	24	*******	*******	*******	**
30-DEC-89	12.2	12.3	12.4	23	86.6	87.9	88.7	23	*******	*******	*******	**
31-DEC-89	11.5	12.2	12.4	24	82.5	87.1	88.7	23	*******	*******	*******	**
GRAND MONTHLY MEAN	12.3	12.5	12.7		88.3	89.7	91.2		0.0	0.0	0.0	

\# A day with less than 24 values.

**** No data values for that day.

@ A value for dissolved oxygen is approaching the objective. (5.0 mg/l or 60% saturation)

? Daily mean flow is below 750 cf/s.

Calibration Certification _____ Date: _____

APPENDIX II

EFFLUENT SPILL REPORT

FOR JULY 30, 1989

EFFLUENT SPILL REPORT

FOR JULY 30, 1989

H. Bailey

Water Quality Branch

Environment Canada

Moncton, N. B.

May 1, 1990

EFFECTS OF EFFLUENT SPILL AT GEORGIA-PACIFIC ON WATER QUALITY OF THE ST. CROIX RIVER

A spill of more than 5 million gallons (U.S.) of partially treated effluent from the Georgia-Pacific Pulp and Paper Mill occurred at Woodland, Me. on July 30, 1989 (Bangor Daily News, Aug. 2/89). Although the spill did result in a decline in dissolved oxygen and pH at Milltown, the water quality objectives of a minimum dissolved oxygen concentration of 5.0 mg/L and 6.0-8.5 for pH were met during the event.

A table of calibration-corrected data from the USGS automatic water quality monitor at Milltown, Me. for the period from July 29 (0100 hours) to August 5, 1989 and graphs illustrating the data for this period are attached. Discharge data from Baring, Me. are also included in the table and graphs.

The most significant effect of the effluent spill was the decline of dissolved oxygen on July 31 when the dissolved oxygen concentrations fell from 7.04 mg/L at 0200 hours to 5.55 mg/L at 0800 hours (Figure 1). The release of water from storage dams increased discharge from 1600 to 2600 cfs at Baring (Figure 3) on July 30 at 2300 hours, which in turn resulted in an increase in dissolved oxygen concentration over the next 16 hours to levels indicative of background water quality at Kellyland.

Figure 2 illustrates effect of the high discharge on specific conductance and pH. The increase in discharge produced a decrease in specific conductance to 40 µS/cm which again is indicative of background water quality. A drop in pH from approximately 7.0 to 6.35 during the event similarly reflected the background levels.

These graphs illustrate the potential deleterious effect such a spill may have on the St. Croix River. In this case, the availability of stored water and its subsequent use mitigated more serious environmental impacts.

FIGURE 1
TEMPERATURE AND DISSOLVED OXYGEN AT MILLTOWN,ME.
FOLLOWING THE EFFLUENT SPILL AT WOODLAND
ON JULY 29,1989 (AWQM DATA)

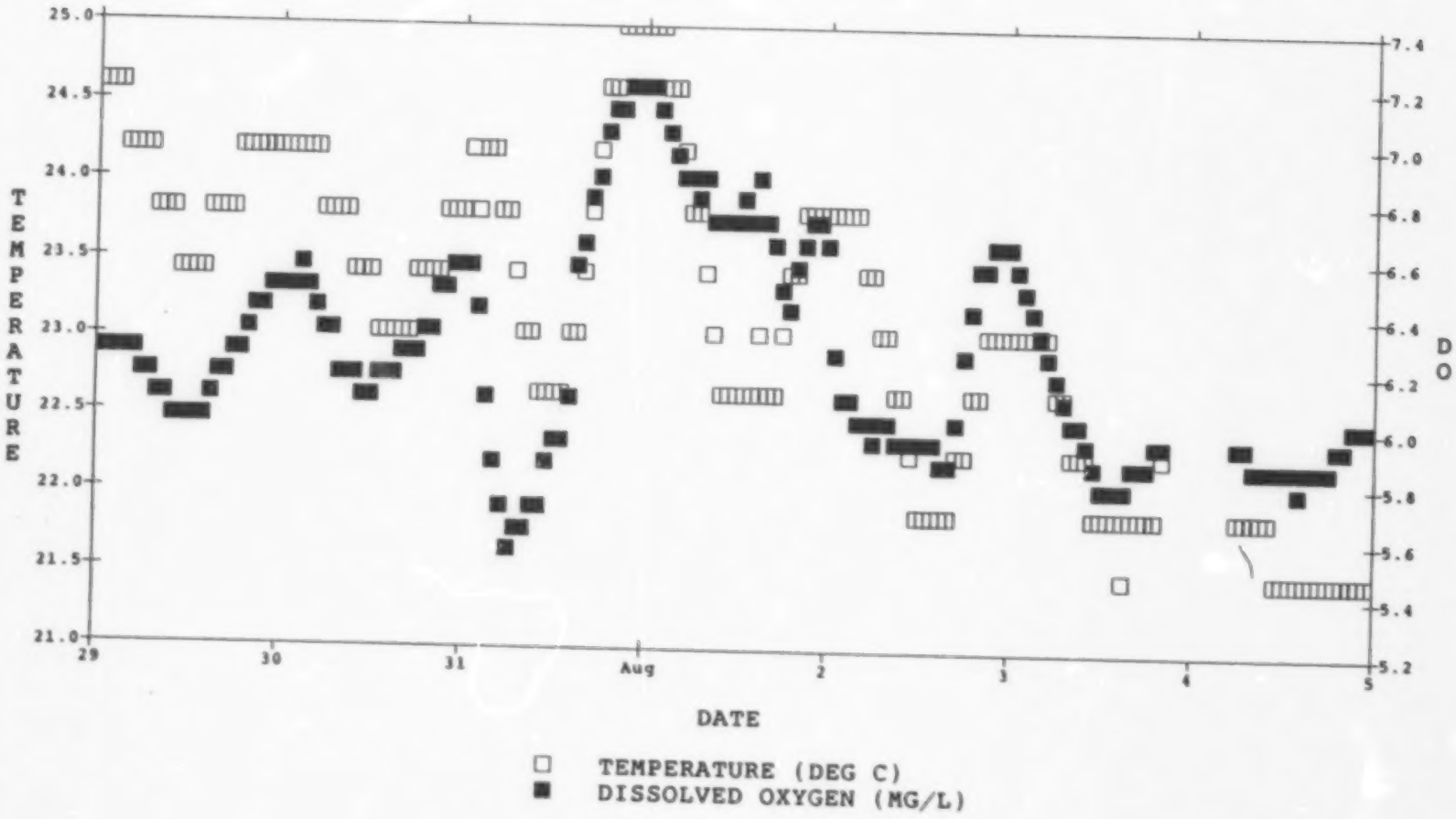


FIGURE 2
SPECIFIC CONDUCTANCE AND PH AT MILLTOWN,ME.
FOLLOWING THE EFFLUENT SPILL AT WOODLAND
ON JULY 29.1989 (AWQM DATA)

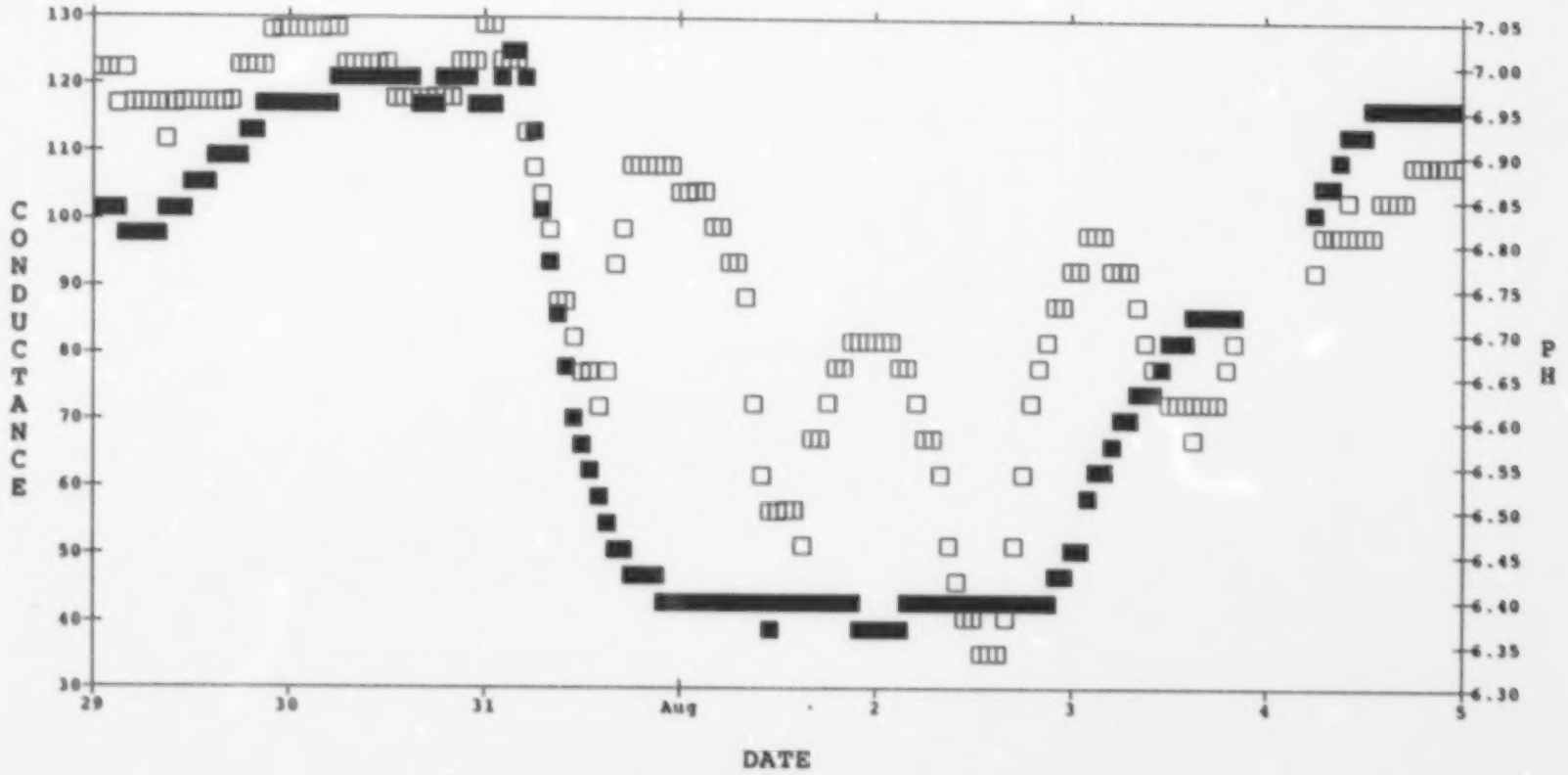


FIGURE 3
DISCHARGE (CFS) AT BARING,ME. FOLLOWING EFFLUENT SPILL
AT WOODLAND ON JULY 29,1989

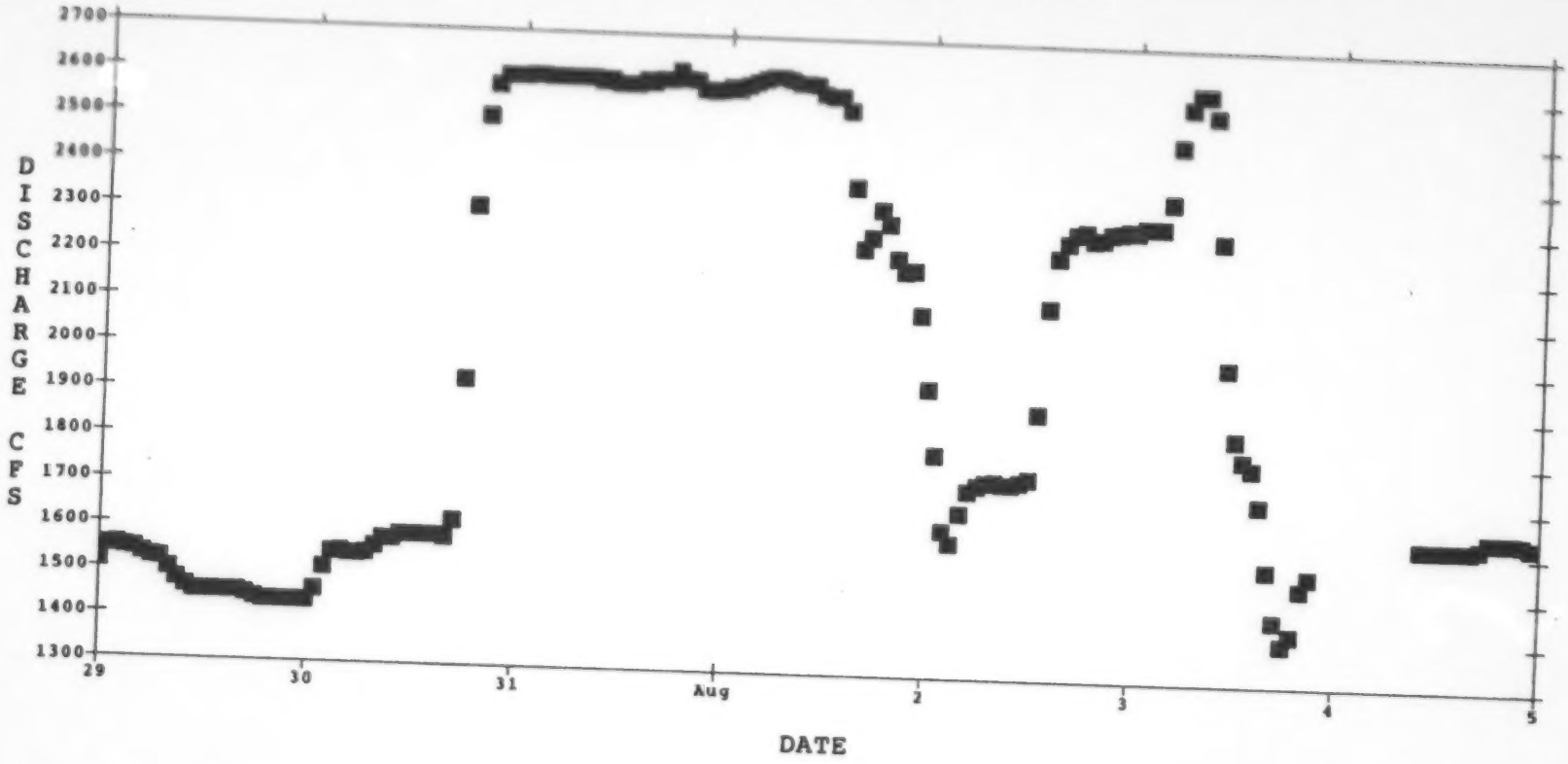


TABLE 1
AWQM DATA FROM THE ST. CROIX RIVER AT MILLTOWN
FROM JULY 29 TO AUGUST 5,1989

0	1 JDAY	2 HOUR	3 COND	4 DO	5 PH	6 WT	7 FLOW CFS	8 DATE-TIME
1	210	1	101.55	6.25	6.99	24.61	1518.871011	29-JUL-89 01:00:00
2	210	2	101.55	6.25	6.99	24.61	1548.502963	29-JUL-89 02:00:00
3	210	3	101.55	6.25	6.99	24.61	1553.086364	29-JUL-89 03:00:00
4	210	4	101.55	6.25	6.95	24.61	1546.213754	29-JUL-89 04:00:00
5	210	5	97.64	6.25	6.99	24.21	1543.926201	29-JUL-89 05:00:00
6	210	6	97.64	6.25	6.95	24.21	1534.792443	29-JUL-89 06:00:00
7	210	7	97.64	6.17	6.95	24.21	1527.959273	29-JUL-89 07:00:00
8	210	8	97.64	6.17	6.95	24.21	1525.684792	29-JUL-89 08:00:00
9	210	9	97.64	6.09	6.95	23.82	1503.028000	29-JUL-89 09:00:00
10	210	10	101.55	6.09	6.91	23.82	1478.286810	29-JUL-89 10:00:00
11	210	11	101.55	6.01	6.95	23.82	1464.869836	29-JUL-89 11:00:00
12	210	12	101.55	6.01	6.95	23.43	1453.730454	29-JUL-89 12:00:00
13	210	13	105.45	6.01	6.95	23.43	1453.730454	29-JUL-89 13:00:00
14	210	14	105.45	6.01	6.95	23.43	1453.730454	29-JUL-89 14:00:00
15	210	15	105.45	6.01	6.95	23.43	1453.730454	29-JUL-89 15:00:00
16	210	16	109.36	6.09	6.96	23.82	1453.730454	29-JUL-89 16:00:00
17	210	17	109.36	6.17	6.96	23.82	1453.730454	29-JUL-89 17:00:00
18	210	18	109.36	6.17	6.96	23.82	1449.285139	29-JUL-89 18:00:00
19	210	19	109.36	6.25	7.00	23.82	1442.628266	29-JUL-89 19:00:00
20	210	20	113.26	6.25	7.00	24.21	1435.984634	29-JUL-89 20:00:00
21	210	21	113.26	6.33	7.00	24.21	1435.984634	29-JUL-89 21:00:00
22	210	22	117.17	6.41	7.00	24.21	1435.984634	29-JUL-89 22:00:00
23	210	23	117.17	6.41	7.04	24.21	1435.984634	29-JUL-89 23:00:00
24	210	24	117.17	6.48	7.04	24.21	1435.984634	30-JUL-89 00:00:00
25	211	1	117.17	6.48	7.04	24.21	1435.984634	30-JUL-89 01:00:00
26	211	2	117.17	6.48	7.04	24.21	1462.638964	30-JUL-89 02:00:00
27	211	3	117.17	6.48	7.04	24.21	1512.071633	30-JUL-89 03:00:00
28	211	4	117.17	6.56	7.04	24.21	1546.213754	30-JUL-89 04:00:00
29	211	5	117.17	6.48	7.04	24.21	1548.502963	30-JUL-89 05:00:00
30	211	6	117.17	6.41	7.04	24.21	1543.926201	30-JUL-89 06:00:00
31	211	7	121.07	6.33	7.04	23.82	1543.926201	30-JUL-89 07:00:00
32	211	8	121.07	6.33	7.00	23.82	1546.213754	30-JUL-89 08:00:00
33	211	9	121.07	6.17	7.00	23.82	1562.273239	30-JUL-89 09:00:00
34	211	10	121.07	6.17	7.00	23.82	1580.728400	30-JUL-89 10:00:00
35	211	11	121.07	6.17	7.00	23.43	1580.728400	30-JUL-89 11:00:00
36	211	12	121.07	6.09	7.00	23.43	1589.997345	30-JUL-89 12:00:00
37	211	13	121.07	6.09	7.00	23.43	1589.997345	30-JUL-89 13:00:00
38	211	14	121.07	6.17	6.96	23.04	1589.997345	30-JUL-89 14:00:00
39	211	15	121.07	6.17	6.96	23.04	1589.997345	30-JUL-89 15:00:00
40	211	16	121.07	6.17	6.96	23.04	1589.997345	30-JUL-89 16:00:00
41	211	17	117.17	6.25	6.96	23.04	1585.359390	30-JUL-89 17:00:00
42	211	18	117.17	6.25	6.96	23.04	1622.661735	30-JUL-89 18:00:00
43	211	19	117.17	6.25	6.96	23.43	1932.533995	30-JUL-89 19:00:00
44	211	20	121.07	6.33	6.96	23.43	2311.146099	30-JUL-89 20:00:00
45	211	21	121.07	6.33	6.96	23.43	2507.842476	30-JUL-89 21:00:00
46	211	22	121.07	6.48	7.00	23.43	2576.925994	30-JUL-89 22:00:00
47	211	23	121.07	6.48	7.00	23.82	2600.232524	30-JUL-89 23:00:00
48	211	24	117.17	6.56	7.00	23.82	2600.232524	31-JUL-89 00:00:00
49	212	1	117.17	6.56	7.04	23.82	2600.232524	31-JUL-89 01:00:00
50	212	2	117.17	6.56	7.04	24.21	2603.573428	31-JUL-89 02:00:00
51	212	3	121.07	6.41	7.00	23.82	2603.573428	31-JUL-89 03:00:00
52	212	4	124.98	6.09	7.00	24.21	2600.232524	31-JUL-89 04:00:00

TABLE 1

AWQM DATA FROM THE ST. CROIX RIVER AT MILLTOWN

FROM JULY 29 TO AUGUST 5,1989

0	1 JDAY	2 HOUR	3 COND	4 DO	5 PH	6 WT	7 FLOW CFS	8 DATE-TIME
53	212	5	124.98	5.86	7.00	24.21	2600.232524	31-JUL-89 05:00:00
54	212	6	121.07	5.70	6.92	23.82	2600.232524	31-JUL-89 06:00:00
55	212	7	113.26	5.55	6.88	23.82	2600.232524	31-JUL-89 07:00:00
56	212	8	101.55	5.62	6.85	23.43	2600.232524	31-JUL-89 08:00:00
57	212	9	93.73	5.62	6.81	23.04	2600.232524	31-JUL-89 09:00:00
58	212	10	85.92	5.70	6.73	23.04	2593.559268	31-JUL-89 10:00:00
59	212	11	78.11	5.70	6.73	22.65	2596.894471	31-JUL-89 11:00:00
60	212	12	70.30	5.86	6.69	22.65	2586.897413	31-JUL-89 12:00:00
61	212	13	66.40	5.94	6.65	22.65	2586.897413	31-JUL-89 13:00:00
62	212	14	62.49	5.94	6.65	22.65	2586.897413	31-JUL-89 14:00:00
63	212	15	58.58	6.09	6.61	23.04	2596.894471	31-JUL-89 15:00:00
64	212	16	54.68	6.56	6.66	23.04	2593.559268	31-JUL-89 16:00:00
65	212	17	50.77	6.64	6.78	23.43	2600.232524	31-JUL-89 17:00:00
66	212	18	50.77	6.80	6.82	23.82	2600.232524	31-JUL-89 18:00:00
67	212	19	46.87	6.87	6.89	24.21	2620.320744	31-JUL-89 19:00:00
68	212	20	46.87	7.03	6.89	24.61	2603.573428	31-JUL-89 20:00:00
69	212	21	46.87	7.11	6.89	24.61	2600.232524	31-JUL-89 21:00:00
70	212	22	46.87	7.11	6.89	25.00	2580.246952	31-JUL-89 22:00:00
71	212	23	42.96	7.19	6.89	25.00	2576.925994	31-JUL-89 23:00:00
72	212	24	42.96	7.19	6.89	25.00	2580.246952	01-AUG-89 00:00:00
73	213	1	42.96	7.19	6.86	25.00	2586.897413	01-AUG-89 01:00:00
74	213	2	42.96	7.19	6.86	25.00	2583.570759	01-AUG-89 02:00:00
75	213	3	42.96	7.11	6.86	25.00	2593.559268	01-AUG-89 03:00:00
76	213	4	42.96	7.03	6.86	24.61	2600.232524	01-AUG-89 04:00:00
77	213	5	42.96	6.95	6.82	24.61	2606.917185	01-AUG-89 05:00:00
78	213	6	42.96	6.87	6.82	24.21	2613.613257	01-AUG-89 06:00:00
79	213	7	42.96	6.87	6.78	23.82	2613.613257	01-AUG-89 07:00:00
80	213	8	42.96	6.80	6.78	23.82	2606.917185	01-AUG-89 08:00:00
81	213	9	42.96	6.87	6.74	23.43	2600.232524	01-AUG-89 09:00:00
82	213	10	42.96	6.72	6.62	23.04	2600.232524	01-AUG-89 10:00:00
83	213	11	42.96	6.72	6.54	22.65	2596.894471	01-AUG-89 11:00:00
84	213	12	39.06	6.72	6.50	22.65	2576.925994	01-AUG-89 12:00:00
85	213	13	42.96	6.72	6.50	22.65	2573.607882	01-AUG-89 13:00:00
86	213	14	42.96	6.80	6.50	22.65	2573.607882	01-AUG-89 14:00:00
87	213	15	42.96	6.72	6.50	22.65	2543.872877	01-AUG-89 15:00:00
88	213	16	42.96	6.87	6.46	23.04	2376.559882	01-AUG-89 16:00:00
89	213	17	42.96	6.72	6.58	22.65	2243.936110	01-AUG-89 17:00:00
90	213	18	42.96	6.64	6.58	22.65	2268.220478	01-AUG-89 18:00:00
91	213	19	42.96	6.48	6.62	23.04	2326.609014	01-AUG-89 19:00:00
92	213	20	42.96	6.41	6.66	23.43	2298.825961	01-AUG-89 20:00:00
93	213	21	42.96	6.56	6.66	23.43	2222.832790	01-AUG-89 21:00:00
94	213	22	42.96	6.64	6.69	23.82	2195.899036	01-AUG-89 22:00:00
95	213	23	39.06	6.72	6.69	23.82	2197.661098	01-AUG-89 23:00:00
96	213	24	39.06	6.72	6.69	23.82	2101.907863	02-AUG-89 00:00:00
97	214	1	39.06	6.64	6.69	23.82	1940.449865	02-AUG-89 01:00:00
98	214	2	39.06	6.25	6.69	23.82	1796.720074	02-AUG-89 02:00:00
99	214	3	39.06	6.09	6.69	23.82	1629.707409	02-AUG-89 03:00:00
100	214	4	39.06	6.09	6.66	23.82	1601.622986	02-AUG-89 04:00:00
101	214	5	42.96	6.01	6.66	23.82	1669.952269	02-AUG-89 05:00:00
102	214	6	42.96	6.01	6.62	23.43	1720.451853	02-AUG-89 06:00:00
103	214	7	42.96	5.94	6.58	23.43	1732.610031	02-AUG-89 07:00:00
104	214	8	42.96	6.01	6.58	23.04	1739.930628	02-AUG-89 08:00:00

TABLE 1

AWQM DATA FROM THE ST. CROIX RIVER AT MILLTOWN

FROM JULY 29 TO AUGUST 5,1989

0	1 JDAY	2 HOUR	3 COND	4 DO	5 PH	6 WT	7 FLOW CFS	8 DATE-TIME
105	214	9	42.96	6.01	6.54	23.04	1742.375156	02-AUG-89 09:00:00
106	214	10	42.96	5.94	6.46	22.65	1737.488270	02-AUG-89 10:00:00
107	214	11	42.96	5.94	6.42	22.65	1737.488270	02-AUG-89 11:00:00
108	214	12	42.96	5.94	6.38	22.26	1742.375156	02-AUG-89 12:00:00
109	214	13	42.96	5.94	6.38	21.87	1749.721835	02-AUG-89 13:00:00
110	214	14	42.96	5.94	6.34	21.87	1893.339598	02-AUG-89 14:00:00
111	214	15	42.96	5.94	6.34	21.87	2124.729560	02-AUG-89 15:00:00
112	214	16	42.96	5.86	6.34	21.87	2234.875219	02-AUG-89 16:00:00
113	214	17	42.96	5.86	6.38	21.87	2268.220478	02-AUG-89 17:00:00
114	214	18	42.96	6.01	6.46	22.26	2286.350388	02-AUG-89 18:00:00
115	214	19	42.96	6.25	6.54	22.26	2292.682607	02-AUG-89 19:00:00
116	214	20	42.96	6.41	6.62	22.65	2274.319330	02-AUG-89 20:00:00
117	214	21	42.96	6.56	6.66	22.65	2277.372924	02-AUG-89 21:00:00
118	214	22	42.96	6.56	6.69	23.04	2289.615106	02-AUG-89 22:00:00
119	214	23	46.87	6.64	6.73	23.04	2292.682607	02-AUG-89 23:00:00
120	214	24	46.87	6.64	6.73	23.04	2298.825961	03-AUG-89 00:00:00
121	215	1	50.77	6.64	6.77	23.04	2295.752892	03-AUG-89 01:00:00
122	215	2	50.77	6.56	6.77	23.04	2304.980456	03-AUG-89 02:00:00
123	215	3	58.58	6.48	6.81	23.04	2304.980456	03-AUG-89 03:00:00
124	215	4	62.49	6.41	6.81	23.04	2304.980456	03-AUG-89 04:00:00
125	215	5	62.49	6.33	6.81	23.04	2360.873267	03-AUG-89 05:00:00
126	215	6	66.40	6.25	6.77	23.04	2485.092571	03-AUG-89 06:00:00
127	215	7	70.30	6.17	6.77	22.65	2570.292617	03-AUG-89 07:00:00
128	215	8	70.30	6.09	6.77	22.65	2600.232524	03-AUG-89 08:00:00
129	215	9	74.21	6.01	6.73	22.26	2600.232524	03-AUG-89 09:00:00
130	215	10	74.21	6.01	6.69	22.26	2553.758959	03-AUG-89 10:00:00
131	215	11	74.21	5.94	6.66	22.26	2277.372924	03-AUG-89 11:00:00
132	215	12	78.11	5.86	6.66	21.87	2002.037949	03-AUG-89 12:00:00
133	215	13	82.02	5.78	6.62	21.87	1847.114727	03-AUG-89 13:00:00
134	215	14	82.02	5.78	6.62	21.87	1801.715826	03-AUG-89 14:00:00
135	215	15	82.02	5.78	6.62	21.87	1784.271871	03-AUG-89 15:00:00
136	215	16	85.92	5.78	6.58	21.48	1703.518724	03-AUG-89 16:00:00
137	215	17	85.92	5.86	6.62	21.87	1559.973999	03-AUG-89 17:00:00
138	215	18	85.92	5.86	6.62	21.87	1447.064705	03-AUG-89 18:00:00
139	215	19	85.92	5.86	6.62	21.87	1394.210373	03-AUG-89 19:00:00
140	215	20	85.92	5.94	6.66	21.87	1416.132320	03-AUG-89 20:00:00
141	215	21	85.92	5.94	6.69	22.26	1518.871011	03-AUG-89 21:00:00
142	215	22					1546.213754	03-AUG-89 22:00:00
143	215	23						03-AUG-89 23:00:00
144	215	24						04-AUG-89 00:00:00
145	216	1						04-AUG-89 01:00:00
146	216	2						04-AUG-89 02:00:00
147	216	3						04-AUG-89 03:00:00
148	216	4						04-AUG-89 04:00:00
149	216	5						04-AUG-89 05:00:00
150	216	6						04-AUG-89 06:00:00
151	216	7	101.55	5.94	6.77	21.87		04-AUG-89 07:00:00
152	216	8	105.45	5.94	6.81	21.87		04-AUG-89 08:00:00
153	216	9	105.45	5.86	6.81	21.87		04-AUG-89 09:00:00
154	216	10	109.36	5.86	6.81	21.87		04-AUG-89 10:00:00
155	216	11	113.26	5.86	6.85	21.87	1617.973787	04-AUG-89 11:00:00
156	216	12	113.26	5.86	6.81	21.48	1617.973787	04-AUG-89 12:00:00

TABLE 1
AMGM DATA FROM THE ST. CROIX RIVER AT MILLTOWN
FROM JULY 29 TO AUGUST 5,1989

0	1 JDAY	2 HOUR	3 COND	4 DO	5 PH	6 WT	7 FLOW CFS	8 DATE-TIME
157	216	13	113.26	5.86	6.81	21.48	1617.973787	04-AUG-89 13:00:00
158	216	14	117.17	5.86	6.81	21.48	1617.973787	04-AUG-89 14:00:00
159	216	15	117.17	5.78	6.85	21.48	1617.973787	04-AUG-89 15:00:00
160	216	16	117.17	5.86	6.85	21.48	1617.973787	04-AUG-89 16:00:00
161	216	17	117.17	5.86	6.85	21.48	1617.973787	04-AUG-89 17:00:00
162	216	18	117.17	5.86	6.85	21.48	1622.661735	04-AUG-89 18:00:00
163	216	19	117.17	5.86	6.89	21.48	1636.769730	04-AUG-89 19:00:00
164	216	20	117.17	5.94	6.89	21.48	1636.769730	04-AUG-89 20:00:00
165	216	21	117.17	5.94	6.89	21.48	1636.769730	04-AUG-89 21:00:00
166	216	22	117.17	6.01	6.89	21.48	1636.769730	04-AUG-89 22:00:00
167	216	23	117.17	6.01	6.89	21.48	1634.413763	04-AUG-89 23:00:00
168	216	24	117.17	6.01	6.89	21.48	1627.357009	05-AUG-89 00:00:00
169								05-AUG-89 01:00:00

Investigation continues into effluent spill at G-P

By Diana Graettinger
Down East Bureau

WOODLAND — The Department of Environmental Protection and officials of the Georgia-Pacific Corp. are continuing their investigations into Sunday's spill of more than 5 million gallons of partially treated effluent from the G-P Pulp and Paper Mill into the St. Croix River.

James Sohns, an environmental specialist with the Bureau of Water Quality Control in the DEP's Bangor office, said Tuesday that he had visited the mill Monday to determine if the spill had had a detrimental effect on the river. He said that tests of the river water 24 hours after the spill showed a drop of effluent in dissolved oxygen, but he said the drop was not large enough to harm the fish in the river.

The DEP specialist said that a smaller, 250,000-gallon spill last Thursday may have been related to the larger Sunday spill. He said the Thursday spill also involved a failure in the pumping system that moved the effluent from primary treatment to secondary treatment.

Gayle Smith, a spokeswoman for G-P in Atlanta, said Tuesday that the company did not think that the two incidents were related.

Smith said that G-P planned to build a large spill-containment system to help prevent spills.

"This is part of the spill-prevention control plan that we have been working on with the state, and once that is completed, it should be able to contain spills if problems occur," she said.

Sohns agreed that a spill-containment system would help prevent small spills in the St. Croix River. "It is very likely that if the system had been completed, the Thursday spill could have been contained," he said. The 5 million gallon spill on Sunday would have overwhelmed even the planned containment system, according to Sohns.

He said spills of untreated effluent from paper mills into the rivers of the state were not uncommon. Sohns said that in the last week, he had responded to three spills at three paper mills — Great Northern Paper Co., Lincoln Pulp and Paper Co. and Georgia-Pacific Corp.

Paper mill closes after waste leak

WOODLAND (AP) — The Georgia-Pacific Corp. closed its paper mill for two days after about 5 million gallons of partially treated waste water had been discharged into the St. Croix River because of a pump failure.

Most of the wood fibers had been eliminated when the water passed through primary treatment, but the pump failure allowed the water to bypass secondary, or biological, treatment, and flow directly into the river.

Company officials said the mill would be closed for about 48 hours while the pump was repaired. The failure occurred Sunday.

Officials from the Department of Environmental Protection went to the site to inspect the spill and investigate the cause. DEP engineer Sue Romatzick said the waste water did not contain raw sewage.

G-P normally discharges between 20 million and 25 million gallons of treated water into the river each day.

Romatzick said the agency would try to determine if the spill were preventable and would examine the company's overall record of compliance with DEP regulations.

These issues will be considered in determining whether or not the company should be fined and, if so, what the fine should be. She said the penalty could be as high as $20,000 because of the volume of water that spilled.